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QUARTERLY MAGAZINE OF THE INTERNATIONAL SOCIETY OF ANTIQUE SCALE COLLECTORS

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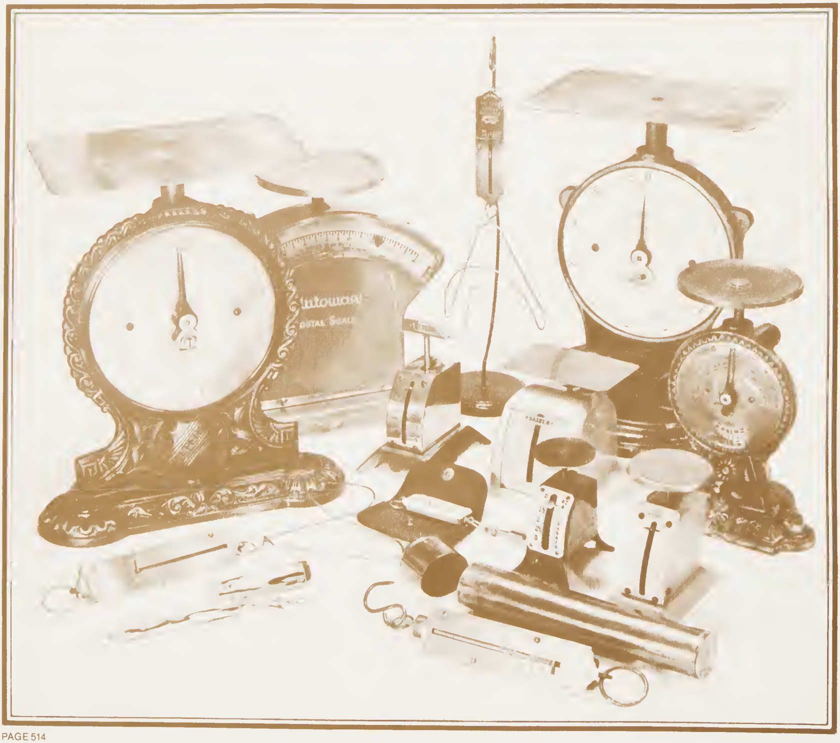


PAGE 514

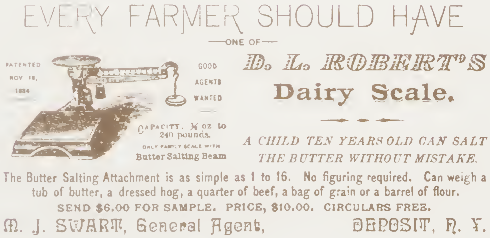
Cover Picture

100 YEARS OF SALTER POSTAL SCALES

The Cover Picture shows a small selection from the immense range of spring scales manufactured by George Salter & Co. for over two centuries. (See the article on page 515).

Old Advert

SENT IN BY TOD CARLEY.



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George Salter & Co (Part 1)

MICHAEL CRAWFORTH

All over the world, the name of Salter is synonymous with high quality spring balances, a reputation which has grown vigorously over two centuries of manufacturing.

William and Richard Salter started work in the 1760's, in Bilston near Birmingham. They were both in the metal-working trade, William making "pocket steelyards" and Richard making springs, some of which he made for William's balances.

"Pocket steelyard" was the contemporary name for what we call a spring balance with a pull-out top, Fig 11. Making such spring balances in England was a new industry, but apparently there was a good market for them. When Richard Salter moved a short distance to nearby West Bromwich, in the 1770's, he too was making pocket steelyards.

According to one biographer*, Richard's business was the more successful one, and Richard took William's sons, John and George, into his firm to make bayonets. However, intensive research+ shows William's firm as the continuing business mentioned in many trade directories, with little trace of Richard's business.

When John and George took over the firm, the name changed to John Salter, but John died in 1823, and the following year the firm became known as George Salter — the name it still has today. George was a very good business man with an inventive mind. In 1838, he patented various ways of indicating weight on spring balances. Among them were the slotted tubular case with a small pointer projecting through a slot; the flat-faced design with a pointer in a slot; and the combination of dial-face and slot. All these have been used by Salter, and copied by many other firms, right up to the present day, Figs 16,18 & 27.

The Factory next door to Salter manufactured sad irons, and it appears that the owners, the Silvester family, were friends of the Salters. In the late 1840's, the two firms amalgamated, and Ted, John, Thomas and Enoch Silvester began to work for Salter. John Silvester later became Works Manager and, in 1862, was made a partner in the firm. He obtained several patents for spring balances, including the 'Quadrant' balance, Fig 25, and the circular balance, Fig 26, both in 1861, and the half-roberval with top pan in 1867, Fig 30. Thomas also took out a patent in 1861, which was for attaching the spring to the bottom of the slide, Fig 3, instead of the top which formerly

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** Mary Bache. + by Alistair Middleton.*
see References (Part 2).

had been the practice. He attached the pointer to an extension fixed to the bottom of the slide and passing up the front of the spring, Fig 3. These new ideas allowed the construction of a more compact balance, using less material. The case was only slightly longer than the spring, and the slot extended over most of its length, Fig 20. Before 1861, the balances had been made with the spring in the top half of the case, the slide in the bottom half, and the slot only half the length of the case, Fig 21. For some reason, this old style continued to be manufactured alongside the improved version, and both were still available well into the middle of the 20th century.

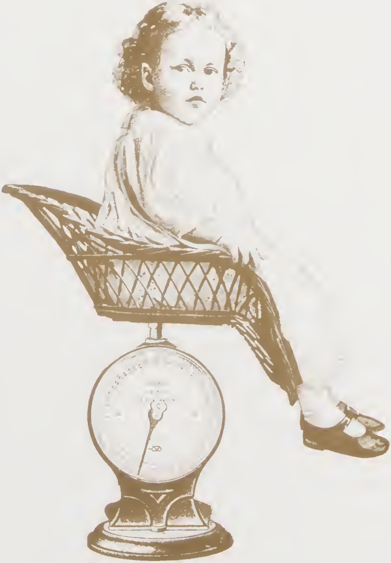
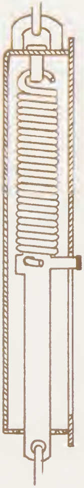
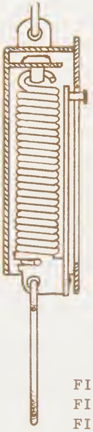


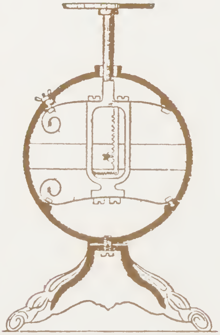
FIG 1. "Infant Weighing Machine No.50J" from the 1933 catalogue. Graduated 0 - 50 lb x 2oz. The white dial was 195mm diameter (7.7"). Cast iron painted white with gold lining. The wicker basket seat was in natural colour.

Another important man in Salter's employ, was John Hughes, who started work there as a boy, in 1845. He became manager of the balance-making department, and was responsible for inventing a new method of constructing top-pan balances. He was co-patentee, with George Salter II, in patenting a platform scale with springs and a dial face on a pillar, in 1883, (Pt.2). Then, in 1903, he patented a scale for weighing the load lifted by a crane. It used the clever idea of spring washers as a resistant capable of balancing the heavy loads. Scales were not the only subject of his ingenuity. For example, he was also responsible for the Hughes door-spring. John Hughes saw all the major developments in spring balances through half the 19th century and on until his death in 1936, at the grand age of 91, only a few weeks after he finished working !

It was typical of Salter's fairness and consideration for their employees that both John Silvester and John Hughes were allowed to register patents in their own names, and that their names were used on Salter balances for many decades; 'SILVESTER'S PATENT', 'HUGHES FAMILY BALANCE', 'HUGHES POCKET BALANCE', 'HUGHES BABY BALANCE' etc, may still be seen commonly on surviving examples.







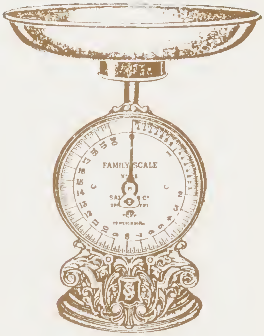


FIG 2. (far left) Slide below the spring. Long case.
FIG 3. (left) Slide in front of spring. Short case.
FIG 4. (above) Ubrig's flat spring patent, 1885.
FIG 5. (right) Kitchen scale. The first 2 lb have expanded graduations. Pieper's patent 1883.

Back in 1849, when George Salter I died, the firm was recorded as making all kinds of springs, improved spring-balances, pocket steelyards, vertical roasting jacks, musket bayonets, portable and convenient domestic weighing apparatus, steam pressure gauges, and Silvester's sad irons. The Company continued to be run by members of the Salter family or by their relatives by marriage, and it continued to expand. Throughout the latter half of the nineteenth century, the firm was in the forefront of providing social care for its employees. By 1859, the works club was established with recreation rooms, dining room and works library. At a time when no insurance was available, a sickness and burial club was started, in 1861, and in 1897, a compensation committee was formed to help any employee who suffered as a result of an accident, although the awards were modest.

In 1884, the Salter trade mark was first Registered. It comprised the Staffordshire knot pierced by an arrow, and it has been marked on Salter balances since that date. During the 1880's, discussions took place with the German firm of UBRIG, in order to establish a market for Salter products in Germany. The outcome was a factory in Berlin which made all kinds of Salter goods, and by the turn of the century, this included such 'modern' products as an automatic meal dispensing machine. Although records show the association with Ubrig had little financial advantage for Salter, there was stimulation for new products; automatic rotating sales display machines; a variety of vending machines including a hen which layed chocolate eggs and a negro who dispensed cigars; and two new ideas for constructing top-pan balances, patented in Britain, one by Emil Ubrig Fig 4, the other by C.Pieper for Ubrig, Fig 5. The latter had a light spring and two strong springs which operated in sequence to give extended graduations for more accurate weighing over the first 2 lb on kitchen scales.

The 1880's was a period of great activity for Salter. Many products were now made, in addition to the staple springs and spring balances. A trade directory of the period lists Salter products as all kinds of springs, all kinds of spring balances for letters, parcels, for trade and for domestic use, various food processing machines for mincing, slicing, chipping potatoes, lemon squeezers, horse-radish scrapers, pipe supports, testing machines, gauges, clothes washers, letter-clips, hat hooks, tinplate, roasting jacks and various dynamometers for industry and for "testing-your-strength" at fairgrounds.

Amusement of the public was only one of the strange uses to which Salter balances and associated products were put. Many unusual applications were recorded. like the balance S.F.Cody borrowed from a butcher and tied to a tree to test the thrust of his aeroplane engine; like the Gun Trials of 1859 when spring balances were used to record the force of various guns with different charges of gun powder; like the spring balance used by Dr. Vivian Fuchs to test the effort required to pull sledges on his Antarctic Expedition of 1956; or the captive golf ball attached to a spring balance which was graduated to indicate the length of the drive which would have been achieved had the ball been free. Special spring balances were also designed for unusual purposes; weighing ostrich feathers, hanks of silk, bicycles, testing grain and counting coins in banks.

It was during the 1880's that P.Everitt approached Salter with his patented invention for a public weighing machine to be made operable by the insertion of a coin. Manufacture was undertaken and the first coin-freed scales were produced shortly afterwards. These sturdy instruments, with cast-iron frames, proved a great success, and they were supplied to the British Automatic Company for 40 years. They, in turn, supplied them to railway stations, piers, amusement arcades and all kinds of site used by the general public.

In 1885, Salter bought the iron founding business of William Bullock & Co, in West Bromwich. This firm had been making all kinds of cast iron products, including sad irons and weights, since the early 19th century. For many decades after this purchase, the Salter catalogue included cast iron weights, bell, ring, brick and flat patterns, even though they made no scales which required them! See Fig 10. Presumably, the custom built up by William Bullock was well worth keeping.

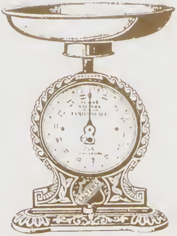
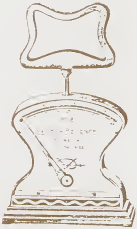


FIG 6. (Left) "Family Scale No.45" from the 1912 catalogue. Available for 7, 14,25,28,50 or 112 lb. With copper-bronze finish. This design is now being made again by Salter.

FIG 7. (Right) "Letter Balance No.18 from the 1904 catalogue. 0 - 16 oz x ¼oz. Nickel plated case. This design is unlike the later No.18, see Fig 28.



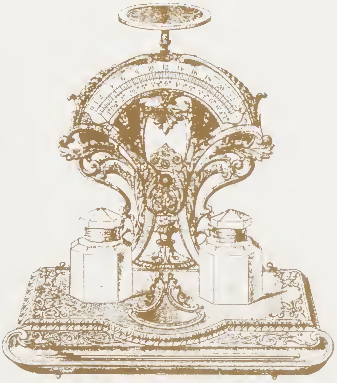


FIG 8.

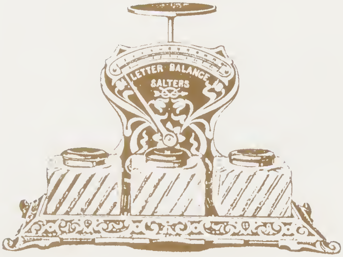


FIG 9.

FIG 10.

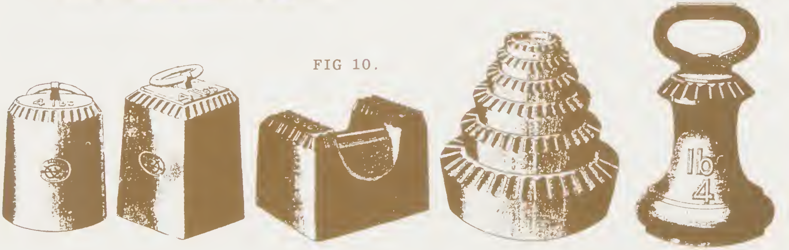


FIG 8. Combined letter balance and inkstand, No.27, from the 1886 catalogue. Graduated 0 - 16oz with postage rates. or 0 - 24oz.

FIG 9. Combined letter balance and inkstand, No.28, from the 1912 catalogue. Patent safety ink bottles, electro copper bronze finish. Graduated 0 - 24oz, with postage rates.

FIG 10. Iron weights from the 1886 catalogue. Round and square ring weights, bar and bell weights, all in denominations 1,2,4,7,14,28,and 56 lb. Flat round stacking weights, 1,2,4,8oz; 1,2,4 lb. The $\frac{1}{4}$ and $\frac{1}{2}$ oz weights were supplied in brass only.

In the 1880's, Salter published a wall poster, or broadsheet, illustrating their factory and many of its products: sixteen balances, dumbbell, roasting jack, coathook, sad iron, blind pulley, tennis equipment and several springs. This attractive poster has been republished, by ISASC, printed in dark brown on cream paper. It is available from Bob Stein.

FIG 11 A "Pocket Steelyard" marked on the back of the slide SALTER & CO. The slide, which pulls out of the top, is graduated 0 - 25 lb. x ¼lb. This type of balance was made from c1760 to the end of the 19th century. Most extant examples have a tension spring, but early ones are said to have a compression spring. The seemingly inappropriate name was commonly used by several different makers. Made from iron with a tubular body rolled from sheet and brazed along the seam. Body length 78mm (3.1"). Many other sizes.

FIG 12 Small letter balance graduated 0 - 2oz x ¼oz, with postage rates for 1871 to 1897. The letter rack faces backwards so that the letter does not conceal the graduations. The rack folds up against the back of the balance to form a neat package for the pocket. Brass face and rack, sheet metal case painted black. Face length 74mm. (2.9"). Similar letter balances, with forward facing racks, were made in several larger sizes. One type had a combined pan and rack with two curled wire 'horns'.

FIG 13 Diminutive letter balance, which, surprisingly, has two springs inside. The white plastic face is graduated 0 - 4oz x ¼oz with postage rates for 1923 to 1940. Nickel-plated case and clip. Face length 47mm (1.9"). The balance fits inside the blue leather purse which has gold lettering. Other versions were made, in a variety of purses, one of which was attached permanently to the balance. The 8oz version had three springs. Shown in catalogues from the 1930's to the 1960's.

FIG 14 to FIG 17 Variations of the combined dial and slide design called by Salter (confusingly) the "circular balance" (see Figs 19,26). The original concept of combining a dial and slot was patented in 1838 by George Salter. It had a manually turned dial which indicated ounce subdivisions of the pounds indicated on the slide. This unusual system was rather like a rotating vernier. It is not known whether this design was ever made.

The balances illustrated all have pointers operated by a rack-and-pinion wheel. Several attempts were made to mark the numbers on the slide so that they could be seen to the satisfaction of the Board of Trade: across the line, above the line and below the line. All were considered to facilitate errors or fraud. The solution was found with the sight-hole design, Fig 17, patented in 1902.

FIG 14 One of the smallest dial-and-slide balances, made before 1884 (no knot trade-mark). Iron case, ring, hook and pointer, brass face. Graduated 0 - 10lb x 2oz on the dial, and 0,10,20,30 lb on the slide. Height of face 170mm (6.6").

FIG 15 This larger balance has the same capacity as Fig 14, but is divided into 1oz divisions. The face is stamped "Each 10 lb is marked by the slide, the intermediate weights on the circle". Height of face 275mm (10.9").

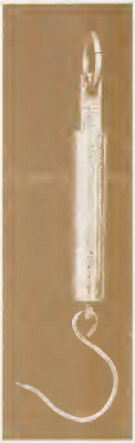


FIG 11.

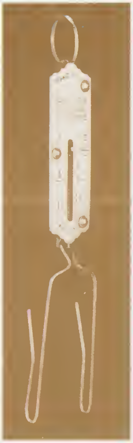
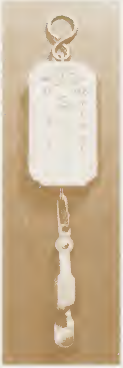


FIG 12.



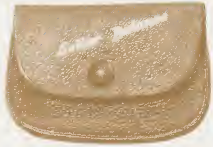
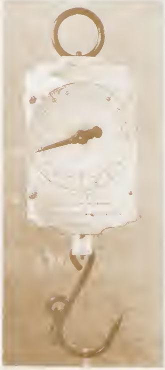


FIG 13.

FIG 14.



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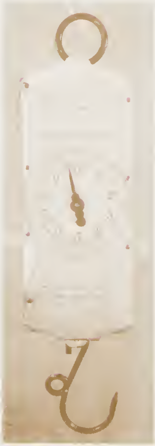


FIG 16.

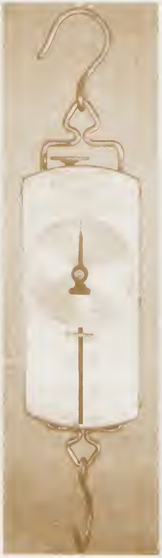


FIG 17.

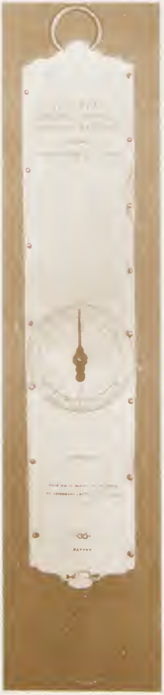


FIG 16 In the 1950's, the pull-out slide was abandoned in favour of the slot and pointer, similar in appearance to the patent of 1838. The entire mechanism was thus protected by the newly styled case. For non - trade use, a zero adjustment screw was provided at the top of the case. It was marked "For correct weight add indication on the slide to weight shown on the dial".

FIG 17 Many different sizes of dial-and-slide balances were made. This is one of the longest. The presence of the sight-hole indicator for the slide indicates a date after 1902. Height of face 530mm (20.9").

FIG 18 A straight-face balance made before the introduction of the 'knot' trade-mark (1884). This type was made in many sizes and capacities ranging from 2 oz for letters to 168 lb for industry, (also in many foreign units of weight). The example shown is one of the longer ones; face length 435mm (17.1"). Brass face graduated 0 - 40 lb x ¼ lb. Listed in catalogues of 1869 and 1877. The same basic design was still available in the 1962 catalogue.

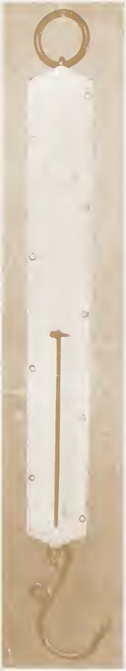
FIG 19 The "Circular Trade Spring Balance No.80T" was shown in catalogues from the 1890's to the 1940's, and a modernised version was available in the 1980 catalogue. They were used for many kinds of weighing in trade and industry, and various circular balances were made in sizes from a 150mm (6") dia. face, 10 lb capacity, to 914mm (36") dia.and 40 cwt. The illustration shows one of 210mm (8.2") dia. and 0 - 20 lb x 1oz. The brass face has a lead plug on the left, for the inspector's stamp.

FIG 20 "Bread Balance" with two iron hooks for sticking into the loaf of bread. Illustrated in catalogues of the 1980's. The legal requirement to use scales in bread vans ended in 1926. Face length 202mm (8"). Brass face graduated 0 - 4 lb x ½oz. A pan on chains was supplied as an alternative to hooks. Balances of different sizes were available, including a circular design.

FIG 21 This general-purpose spring balance was made pre-knot, and is a shorter example of the kind described in Fig 18. The spring occupied the top half of the case and the slide was in the bottom half. Compare this with Fig 20, where the spring and slide together, occupy the full length of the case. Brass face, iron case and hook. Face length 168mm (6.6"). Graduated 0 - 40 lb x 1 lb.

FIG 22 Letter balance graduated 0 - 250 grams x 5g for the export market. This type, with a tubular brass slide, was sturdily made and of high quality, very superior to the cheap and crudely made imports. Face length 115mm (4.5"). It was shown in catalogues from the 1890's to the 1930's, usually with British postage rates and ounces.

FIG 23 "Avery's Improved Spring Balance" was actually made by Salter, as their knot trade-mark indicates. This example is stamped Class II and therefore comes from the period 1893 to 1907. Graduated 0 - 8 lb x 2oz. Face length 208mm (8.2").



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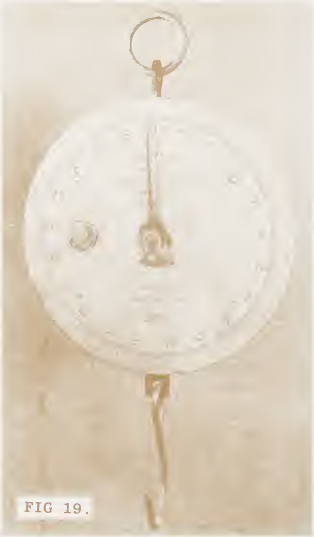

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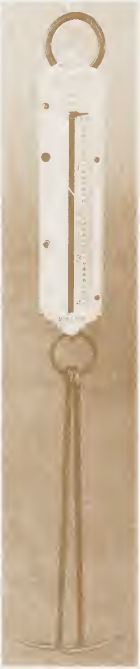

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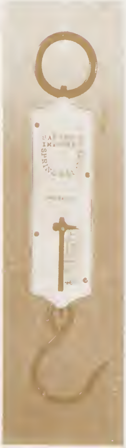

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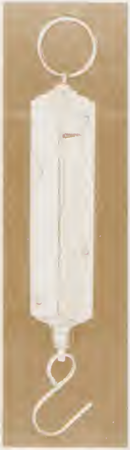


FIG 22.

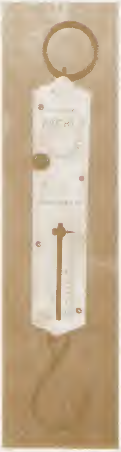


FIG 23.

FIG 24 Three examples of No.11, with dial-face and a pointer operated by a rack and pinion. The same basic design was used for several different purposes; 11 postal; 11A airmail; 11D diet; 11E eggs; 11ET egg balance for trade; 41 equivalent balance; 41 corn scale; and a self-indicating rain gauge. The principle was patented in 1867.

a) This attractively decorated design seems to have been introduced in the 1890's, but was still available in the 1930's. Graduated 0 - 32 oz, with postage rates for 1920-22, copper-bronze finish, brass face, height 178mm (7"). Also available in dark green and gold, with a white enamel face, or a porcelain face.

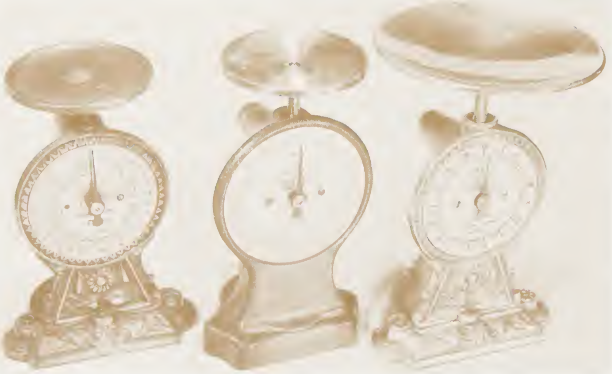
b) The plain version was introduced in the 1930's, but was made concurrently, with the decorated version, for some years. Graduated 0 - 24oz, with postage rates for 1940-52. Copper-coloured paint, brass plate, white enamel face, zero adjustment screw on the side, height 188mm (7.3").

c) No.11D, for diabetic diets, was made entirely of aluminium, to make it as light as possible for carrying. It was available in a black leathercloth covered box with a leather handle. It was shown in catalogues of the 1930's. Uncoloured aluminium, graduated 0 - 8oz x 2 drams, white enamel face, lift-off pan, height 200mm (8").

FIG 25 The "Quadrant Balance" patented by John Silvester, in 1861. It was available in capacities 7,14,28,56,112 or 200lb, with hook or with a pan on chains. The example shown is graduated 0 - 112 lb x 1 lb, and was permitted for trade use, Class II (current 1893 to 1907). In the 20th century, this design was no longer approved for trade, and appeared in catalogues "for export". Cast iron case with a brass plaque and quadrant. Height of face 135mm (5.3").

FIG 26 The "Circular Balance" registered in 1859, and still illustrated in Salter catalogues of 1935. The rack-and-pinion operating the pointer were enclosed inside the heavy cast-iron case, but the two springs were exposed behind the face. A modified design, with a case covering the springs, was patented in 1861. Both designs were made concurrently. Brass face, dia. 130mm (5.1"). The screw and slot on the pointer permitted a limited adjustment to zero.

FIG 27 Tubular brass spring balances ranging in length of body from 232mm to 55mm (9.1" to 2.1"). The length was related more to the accuracy required, than to the maximum capacity. For example, the smallest one shown weighs up to 12 lb to the nearest ½lb, for general - purpose weighing, but No.4, although much longer, only weighs up to 10oz Troy. The graduations are spread over a greater length so that it can be read to an accuracy of 1/10 oz. No.1 has a capacity of 60 lb.



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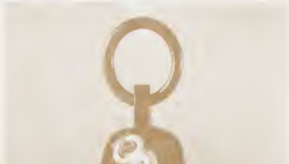


FIG 25.

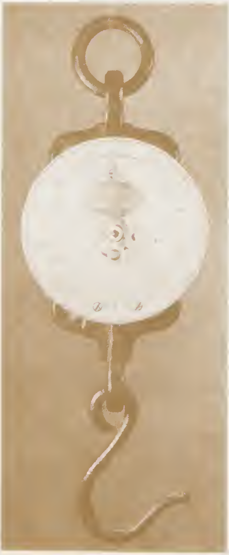


FIG 26.

FIG 28. Stages in the development of No.18, bow-front letter balances. Other versions of this design, 18E and 18D, were for eggs and dietary purposes, respectively. All work on the same principle of half-roberval and spring.

a) This small and attractive design, with scroll feet, was registered in 1901, No.686505/6. It was replaced by the larger version with lobe feet (b), in the 1920's. The one shown is graduated 0 - 8oz, with postage rates for 1923-40. Copper-bronze finish, height 80mm (3.1").

b) The lobe foot design started in the 1920's, and was replaced by the straight based design (d), in the 1950's. Graduated 0 - 8oz, with postage rates for 1956-57. Painted pale green with a brass letter plate, height 100mm (4"). Early examples had dark green paint or a copper-bronze finish.

c) The wire letter-rack, marked LETTERS, was an alternative to the plate shown in (b). It had the advantage that large letters did not hide the graduations, as happened with the flat plate. Graduated 0 - 4oz, with postage rates for 1923-40. Copper-bronze finish, brass face and rack, height 140mm (5.5").

d) This flat-based version started in the 1950's. Graduated 0 - 8oz with postage rates for 1956-57. Painted pale green, with a brass letter plate, height 95mm (3.8").

e) A modernised plastic version was introduced in the early 1960's. Adjustment of zero was by sliding the graduated chart up or down. The previous designs had an adjustment screw on top of the case. Graduated 0 - 8oz, with postage rates for 1957-65. Pale gray plastic, brass letter plate, height 86mm (3.3").

FIG 29 "Hughes' Family Scale" first made by Salter in the early 1900's and still shown in the 1939 catalogue (but with an oval pan). A half-roberval and spring mechanism operates the pointer by rack-and-pinion wheel. Sheet metal case painted black and decorated with gold lines. The same basic design was used for a baby scale and an equivalent balance. Height 270mm (10.6").

FIG 30 This dial-face balance has two half-roberval linkages at 90°, allowing a lighter mechanism to be used than in the Hughes' balance, Fig 29. The design was patented in 1867, and catalogues of that period show the plain casing illustrated in Fig 30, but with a round pan. More decorative versions were later produced, and there were variations for several purposes; postal, kitchen, baby, bank, dairy, butter and trade use. A modernised version was still being offered in the 1980 catalogue, and reproductions of the early 20th C. decorative style are currently being made by Salter. The example shown is a parcel balance graduated 0 - 11 lb x 1oz, with postage rates for 1923 to 1935. Cast iron case painted dark green with gold highlights; white enamel face, brass parcel plate. Height 255mm (10").

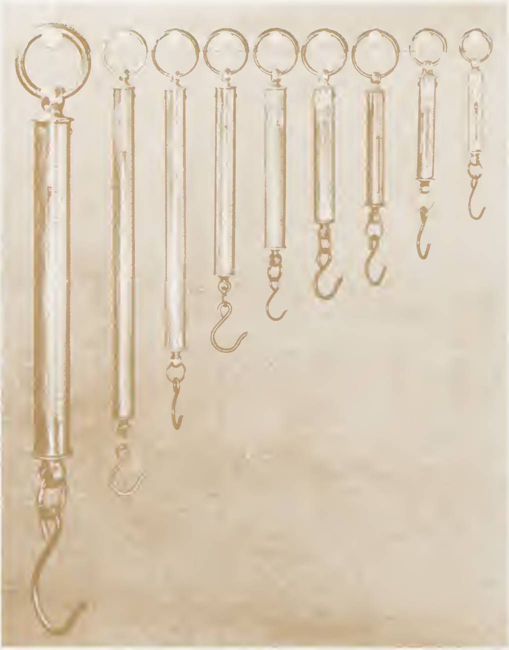


FIG 27.

FIG 28.

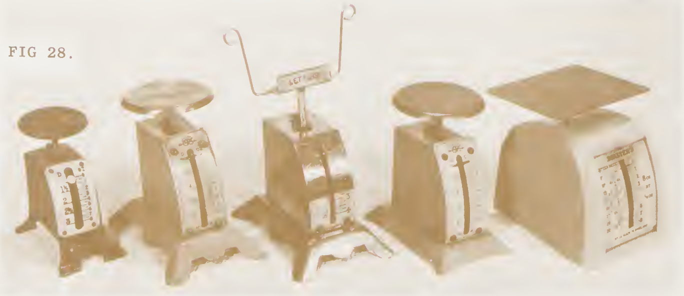


FIG 30.

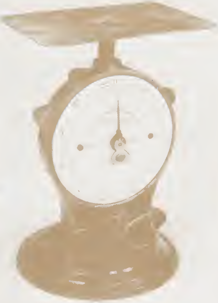


FIG 29.

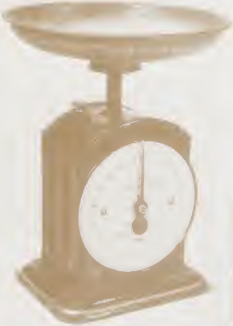
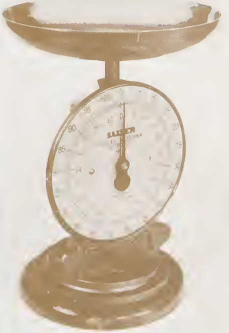
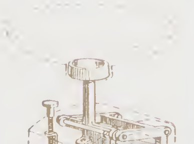


FIG 31.





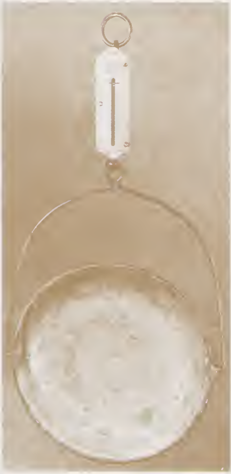


FIG 32.

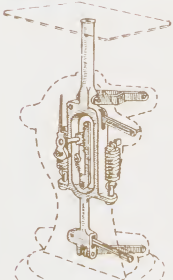


FIG 31 A banker's balance "Silver and Copper Checker No.53" graduated 0 - £100 silver coins and 0 - £5 copper coins. The balance was used for counting the coins, not weighing them, so it was not required to be inspected by W & M. The mechanism is a later version of that in Fig 30. Cast iron case painted gold; white painted face; brass pan; wooden base. Height 330mm (13").

FIG 32 "Hughes' Household Balance". The patent referred to on the balance and the pan, appears to be that of Thomas Bache Salter and John Hughes, of 1884. The inference is that there was a patent for the pan, which swings to a vertical position for storage flat against a wall, as illustrated. No patent has been found by the author. The brass face is graduated 0 - 5 lb x 2oz. Sheet metal case painted black; tinned iron pan dia. 182mm (7.1"). Shown in catalogues from 1912 to 1933.

Showcase

ILLUSTRATIONS ARE ON PAGE 530.

1. Shop scale by Howe of Brandon, Vermont, U.S.A. The address indicates that this is an early example of Howe's work, from the period 1870 to 1880. Cast iron. Weights were stacked on the central platform, and a brass scoop fitted on the spider. (weights and scoop missing). The capacity was 6 lb.

AL EACHES COLLECTION

2. English letter balance marked on the plinth H.B.WRIGHT No.130 LONDON DEC^{r}. 20, 1839. (The number and date of Design Registration. - Editor) Brass tubular beam with a telescopic sliding weight. Graduated 0 - 4oz. Brass plinth and black patinated brass boy. Black marble base.

BOB STEIN COLLECTION

3. German shop scale of the Beranger type, late 19th century, capacity marked on the centre of the frame, 5kg. (Similar scales were illustrated in the Steinfeld & Blasberg catalogue c1895. - Editor).

HERBERT GRIESHABER COLLECTION

4. Solid silver postal weights by T.N. with a London hallmark for 1895. Denominations 2,1,½,½ oz.

GERARD HOUBEN COLLECTION

5. Letter scales, late 19th century, marked underneath the base AUSTIN, 9 Westmoreland, Dublin. Brass with engraved decoration. Brass filigree overlays on a walnut base.

LOU UIT DEN BOOGAARD COLLECTION

1

2.

SHOWCASE

3.

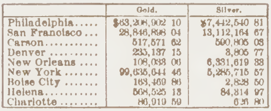
4.

5.

The New York Assay Office

The following account of weighing and assaying was extracted from an article "The United States Assay Office at New York" in Harper's Weekly of January 14th, 1882. The Editor is indebted to EMIL COHN Jnr. for sending this interesting item.

The mint system of the United States embraces five mints, where coin is made, and five assay-offices. The mints are located at Philadelphia, San Francisco, Carson, New Orleans, and Denver; the assay-offices at New York, Charlotte, Helena, Boise City, and St.Louis. The last, however, is not yet in operation. Of these, the Philadelphia and San Francisco mints and the New York Assay-office do by far the larger part of the work required, as will be seen by the following table, showing the value of deposits and purchase of gold and silver bullion at the several establishments during the fiscal year ending June 30th 1881:



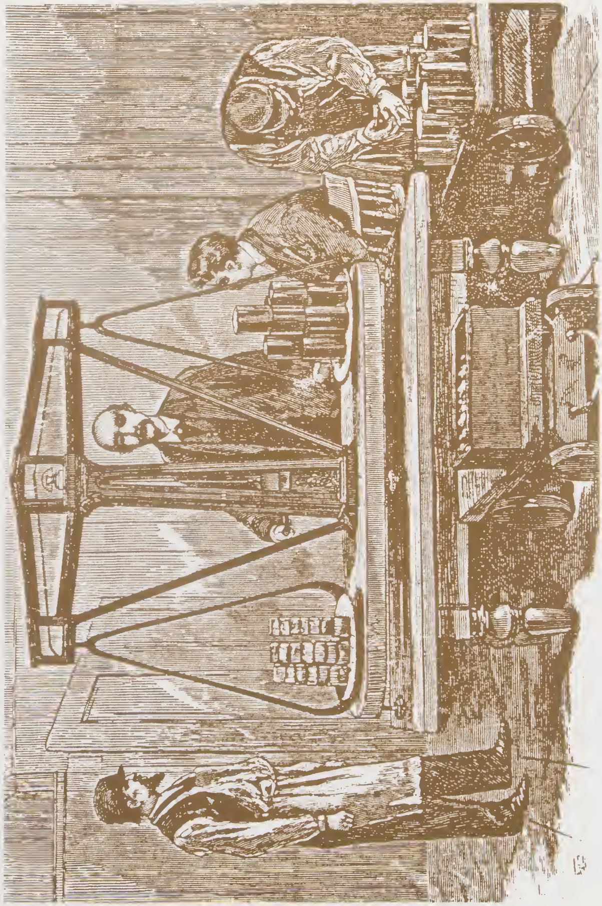
	Gold.	Silver.
Philadelphia.....	$63,208,902 10	$7,442,540 81
San Francisco...	28,846,898 04	13,112,164 67
Carson...........	517,571 62	590,806 03
Denver	235,137 15	8,806 77
New Orleans	108,098 00	6,331,619 88
New York	99,635,644 46	5,285,715 57
Boise City	163,469 80	2,828 50
Helena...........	568,525 18	84,814 97
Charlotte	86,919 59	658 80

Thus, out of a total of $226,225,522 gold and silver deposited and operated upon, all but $8,693,656 was received at the three offices named. Of the three, the largest amount $104,921,360 was deposited at the New York Assay-office. It is to this important office that we want to introduce the reader of Harper's Weekly.

Walking down Wall Street from Broadway, we come to an unpretending, dingy old building two stories high, standing next to the massive Greek temple in which the chief financial operations of the government are carried on. Surveying it from the outside, one would hardly suspect this to be the principal assay-office of the United States.

Passing through the vestibule, we come into a large apartment, which we are informed, is the "Weigh-Room". It is here that the deposits of bullion are received, and paid for, when their value has been ascertained. And here, perhaps, is the best place to explain, for the benefit of those who may not happen to know, just what the Assay-office is for.

Let us suppose that you have a quantity of gold or silver bullion - say a fair nugget of gold sent you as a Christmas present by a mining friend. You might sell it to a bullion dealer, who would guess - and guess low - at its value; but of course you would rather get at the exact worth of it. This you can do by handing it to the Weigh Clerk at the farther end of this long counter, adorned with handsome and scrupulously accurate balances. He will weigh it, giving you a receipt for the amount, expressed in Troy ounces. Then he will send it to the melting-pot to be freed from earthly impurities, and made homogeneous by stirring when in the melted condition. After melting, it will be run into a bar, re-weighed, and two small bits clipped from opposite ends by a powerful cutting machine. These bits, called "assay pieces", will go to the assayer, who, by a series of



Weighing gold bars in the New York Assay Office, 1882.

delicate operations will ascertain the proportion of gold and silver (if there be any) in the deposit. From his report, the value of the whole will be calculated and paid you in gold coin, or, if you prefer, in a "fine" bar nearly pure (say 998 parts of gold in 1000), or a "standard" bar (900 parts in 1000), stamped with its fineness, weight, and value, and good as "coin of the realm" for commercial purposes. Any silver contained in the deposit will be paid for in standard silver dollars. From the gross value, certain charges will be deducted in making the calculations to cover the actual cost of the operation. Your precious nugget will then be passed over to the melter and refiner, who will manufacture it, with other deposits, into fine bars for payment to depositors, or for transmission to the Philadelphia mint to be coined. This, in brief, is substantially the history of every deposit, whether it be in the form of coin, amalgam, nuggets, jewelry, or what not. The object of the Assay-office, then, is to take the people's bullion, ascertain its exact value, refine it, and return its equivalent to the owner in the form of coin or stamped bars.

Before leaving the Weigh-Room, we are permitted to peep into a large grimy apartment called the "Deposit Melting Room", where the first melting takes place. Toward the rear end are several furnaces. Piles of bars are near the furnaces, some waiting to be dropped into the sevenfold-heated crucibles; others just rescued from the fiery ordeal, and still glowing with the terrific heat. But what is this? A box of elegant new sovereigns, stamped with the image and superscription of her virtuous Majesty of Great Britain and Ireland. Surely those are not going to be melted up? Yes, indeed. With ruthless shovel the operator scoops up the handsome coins and dumps them, in all their shining beauty, into the gaping crucible. All the labor and cost of minting them thrown away in a minute! "What vandalism!" we cry. But, such vandalism must be, until the joint wisdom of the great commercial nations recognizes the folly of it, and devises a reasonable system of international coinage. More than $54,000,000 in value of foreign coins (besides $37,000,000 in foreign bullion) were melted up in this room during the last fiscal year.

In another part of the room an interesting scene is just now enacting. The new Superintendant wants to know just how much bullion he is going to be responsible for, and his representative is taking account of the stock, with the help of the weigh clerk and other employees. It is a long and tedious operation. About $40,000,000 in gold bars are stored in the capacious vault whose massive walls and doors are before us. This immense treasure must be counted, and the work is performed by weighing it. On one side of yonder mighty balance are placed carefully tested brass weights to the amount of about 4,000 ounces Troy. On the other side are piled gold bars of an average weight of 240 ounces, and worth about $4,900 each. Small weights are added or removed till the two sides exactly balance, and the weight is noted down. It takes four or five days to complete the task.

While in this opulent apartment, a young man comes down from the Assay Laboratory on the second floor, with a small wooden tray. He is after the "assay pieces", which are cut and arranged in order on the tray, each pair with its appropriate number, and carried to the laboratory. Let us follow and see what will be done with them.

The first thing to be done is to ascertain the proportion of gold and silver contained in the deposit. Small portions of the assay pieces are weighed by experts on the most delicate balances that skill can make - so delicate that the smallest of "small dust" must be brushed away, and the slightest breath of air excluded by glass cases, before the weighing is done. About two parts of silver are added to the gold, which is then wrapped in a small square of lead foil, placed in a tiny crucible of calcined bone, called a "cupel", and introduced into a "muffle furnace" whose glowing interior reminds one of Nebuchadnezzar's famous oven. The lead soon melts and sinks into the porous crucible, carrying with it whatever base metals are present. This leaves a little button of gold and silver, almost absolutely pure A second weighing shows the proportions of base metals - copper etc. - in the deposit. To get at the proportion of gold, the button is rolled into a thin strip, made into a little scroll called a "cornet", and boiled in nitric acid. The acid eats out the silver and there remains a little roll of pure gold. Weighed again, the proportion of gold and silver is revealed, and from this result may be calculated the value of the deposit, be it $100 or $100,000.

Silver assays are made by what is called the "humid" process, but our limited space forbids a description of it.

From the Assay Laboratory we betake ourselves to the Refinery, a many-storied building in the rear of the one we have been exploring. The operations here are all on a large scale. Many furnaces similar to that in the Deposit Melting Room line the room, and great quantities of gold and silver, in various stages of refining, lie around in apparently careless profusion. Apparently careless only, however, for at every step the metal is weighed by responsible officials, and every grain is rigidly accounted for.

The operations of this department are too numerous and complicated for detailed description here. Suffice to say that gold bullion containing silver and base metals is first melted and then treated. This process, called "parting" - i.e, separating the silver from the gold - leaves the gold nearly pure, and ready for commercial use or for transmission to the Mint for coinage.

So, we leave the Assay-office, which was organised in October 1854, where within its modest walls, black with age and dirt, safely repose at the present time some $50,000,000 of the precious metals.

Enlightenment

Photographers please note there was a typing error on page 365. The photoflood lamp mentioned in line 3 should, of course, be 275 watts (not 75W !).

Notes & Queries

NQ 66 SCANDINAVIAN STEELYARD — note from E.Cohn Jr.

I refer to the steelyard shown in the recent issue of EQM, page 478. My collection includes a similar one 25" long (635mm), purchased in Denmark. It was said to be early 19th C. Danish, or possibly, from another country in Scandinavia. The triangular handles are about 4" per side (100mm).The poise is bronze, 4" in height and 2" in diameter (100 x 50mm). The top is marked with a crown over what looks like a 'G', and below this, is an impression that looks like the upper part of a church steeple, with other marks around it, and a dotted edge. Both of these marks are over ¼" in diameter (7mm), but, as they are impressed heavily into the metal, they are hard to read. The upper edge of the heavy end of the beam is marked with a K, 1817, and again, the steeple. The very end on the flat edge has 1817 stamped on it, plus an indecipherable mark. A similar steelyard is in the Frilandmuseat at Lyngby, Denmark.

COMMENT — from the Editor.

Denmark never had a monarch with the initial 'G', but Sweden's King Gustavus IV reigned from 1792 to 1809. (ref Haydn's Dictionary of dates).

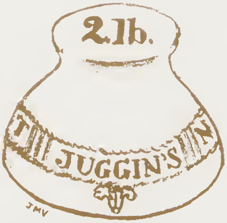
NQ 67 POT WEIGHT — note from J.M.Visser.

I recently bought four pot weights 2,1,½,¼ lb. Only the 2lb is in good condition. They are marked in green around the body JUGGIN'S NEW ENAMEL WEIGHT, with the denomination on top of the knob. Underneath is a crowned Copeland and Garrett mark.

COMMENT — from the Editor

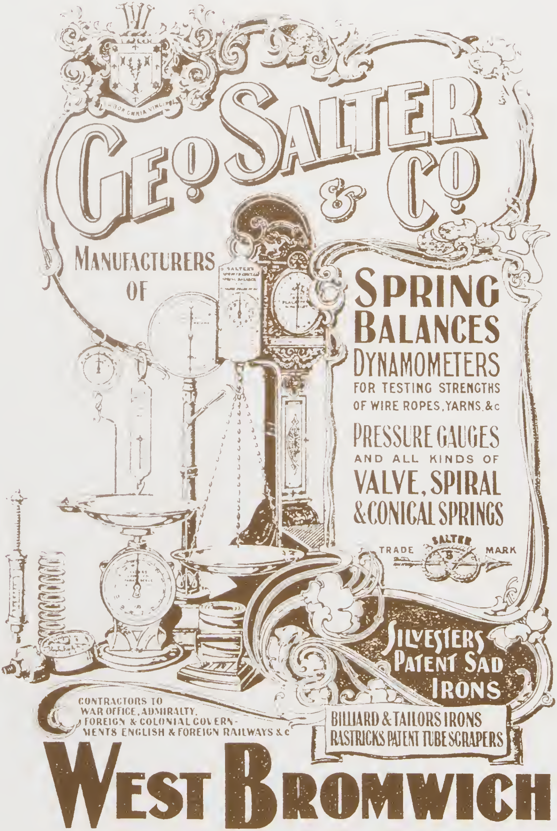
This weight adds further evidence to the work of Gillian Dick, EQM pages 83-86, as the crowned mark of Copeland & Garrett was used between 1833 and 1847. (ref. Collector's Pocket Book by Bernard Hughes).

Some pot weights with coloured decoration were made to match the ceramic pillar of butcher's stand scales. I have seen an attractive example by Avery's with pink lustre and gold bands.



Old Advert

From the Salter catalogue of 1904.



GEO SALTER & CO

MANUFACTURERS OF

SPRING BALANCES

DYNAMOMETERS

FOR TESTING STRENGTHS OF WIRE ROPES, YARNS, &c

PRESSURE GAUGES

AND ALL KINDS OF

VALVE, SPIRAL & CONICAL SPRINGS

TRADE SALTER MARK

SILVESTERS PATENT SAD IRONS

CONTRACTORS TO WAR OFFICE, ADMIRALTY, FOREIGN & COLONIAL GOVERNMENTS ENGLISH & FOREIGN RAILWAYS &c

BILLIARD & TAILORS IRONS

RASTRICKS PATENT TUBE SCRAPERS

WEST BROMWICH

Patent Postals

MICHAEL CRAWFORTH

A SURVEY OF POSTAL SCALES PATENTED IN BRITAIN, 1840 TO 1940.

1883 27 Apr. No. 2146. C.H.BARTLETT. See Fig 37.

A postal balance, of the table-steelyard type, is provided with two parallel beams, each having a sliding weight, one for pounds, the other for ounces. The beam for the ounces projects across the axis, so the weight at zero acts negatively. A rod extending beneath the parcel plate and fitted with a screw thread, serves to adjust the balance and can be locked by pouring lead into the cavity provided.

No drawing was supplied by the patentee, but the balance shown in Fig 37 meets the description. It has no maker's name, but is marked PATENT. The adjustment screw is locked by a nut, and not by lead, (a typical minor variation resulting from practical experience).

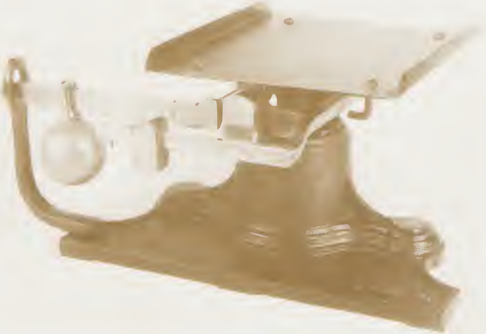


FIG 37. Parcel scale graduated 0 - 7 lb on the main beam and 0 - 16oz on the side beam. Iron parcel plate, cast iron base painted black, brass beams. The description matches Bartlett's patent.

1883 18 Aug. No. 4009. W.TOZER See Fig 39.

A tape-measure, enclosed in a circular brass case, is attached to the top of a tubular brass spring balance of standard design.

This balance was introduced for the start of the Parcel Post on August 1st, 1883. The tape measure was for checking the size of parcels, which had to be within specified maximum dimensions :- maximum length 3ft 6ins, length plus girth not to exceed 6ft. Weight and postage could be determined from the spring balance. This design was produced by Geo.Salter & Co. (Compare with No.16725, by Ragg, page 538).

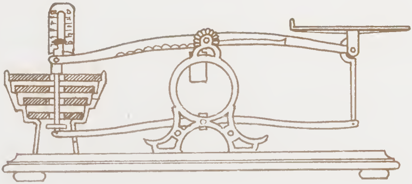


FIG 38. Gilmore and Clark's letter balance. The conical cover is cut away in the drawing to show the weights. The block below the centre of the beam appears to be the sliding weight mentioned in the patent.

1884 2 Oct. No. 13101. J.GILMORE & W.R.CLARK See Fig 38.

On a roberval scale, the weight pan is omitted. The leg connecting the beam to the stay passes through a central hole in a pile of disc-shaped weights which rest in a conical cover. When the beam tilts with the letter, the weights are picked up one after the other until there are sufficient to balance the load. An upward extension of the leg carries a pointer which indicates the weight and postage on a vertical chart. A sliding weight may be added to the beam to provide additional capacity.

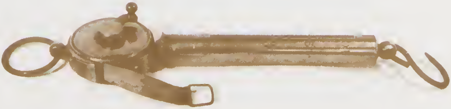
Although the patentee did not mention postal purposes, the drawing in the patent documents shows postage rates on the chart. Weight-lifting beams were not new, so this patent was for the particular method of using the established principle. No example has been seen by the author.

1884 20 Dec. No. 16725. A.E.RAGG See Fig 43.

A tape measure, enclosed in a circular metal case, forms the weight of a hand-held pendulum balance. A combined letter clip and hook has alternative positions within a slot in the beam, one position for letters, the other for parcels.

This patent extends the facilities of Ragg's previous design of 1871 (see EQM pages 481 & 484), by adding the means of weighing and measuring parcels. The simple use of two positions for the hook greatly extends the capacity of this little balance from 12oz for the letters, to an impressive 5 lb for parcels. The accuracy of the instrument depends upon the position of the handle not affecting the leverage of the weight. Was it counterbalanced inside? No example has been seen by the author. (Compare with Tozer's balance, Page 537).

FIG 39. Tozer's parcel tape and spring balance, made by Salter's. All brass, with a steel hook and ring.



1885 13 Feb. No. 2040. A.G.BROOKES (for M.G.Cook) See Fig 40.

A roberval scale has a slotted plate attached to the weight end of the beam. The slots are parallel and vertical, and each successive slot is longer than the previous one. Passing through each slot is a sheet metal weight hinged at one end. When the parcel causes the beam to tilt, the slotted plate lifts a succession of weights until equilibrium is achieved The motion of the beam is transmitted to a rotating pointer by a rack-and-pinion. The dial is graduated 0 - 8oz x ½oz with various postage rates. For parcels over 8oz, half-pound weights are added to the weight pan, as required, the dial indicating the ounces.

This patent covers another variation of the established weight-lifting beam principle, with the addition of a useful dial indicator. No example has been seen by the author. The idea of a slotted plate and sheet metal weights was used, in the 1920's, for an American egg scale, (See EQM p383 Fig 21).

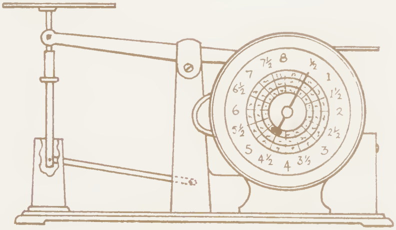


FIG 40. Cook's interesting combination of roberval, weight-lifting beam and dial indicator. The weight plate can just be seen behind the dial.

1885 17 Feb. No. 2207. H.J.HADDAN (for R.Watson) See Fig 41.

On a typical steelyard counter scale with a half-roberval linkage, the leg, stay and centre pivot have knife edges. This part of the mechanism is enclosed in a cover. The purpose is to provide greater accuracy and to exclude dust and dirt.

Although postal purposes are not mentioned, the example shown in Fig 42, is a postal scale and meets the patent description.

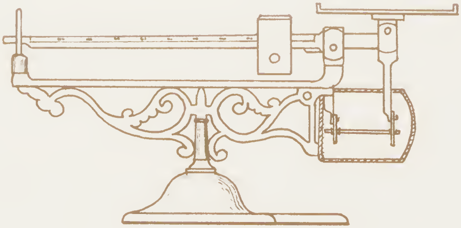


FIG 41. Watson's counter steelyard was attractively styled. The cover box is cut away in the drawing, to show the knife edge arrangement on the leg and stay.

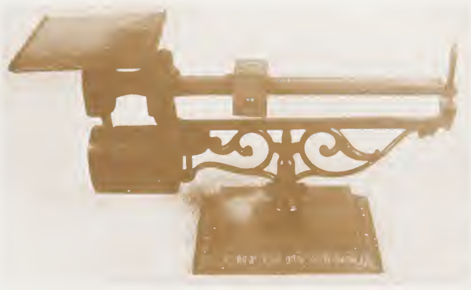


FIG 42. Postal scale made to the patent of R.Watson. The base differs from that shown in the patent.

1885 7 Mar. No. 3020. H.J.HADDAN (for R.Watson) See Fig 44.

On a typical steelyard counter scale, with a hanging pan, the beam is of inverted 'U' section; the shackle has a screwed stop to prevent accidental removal from the knife-edge; the letter plate has a cup beneath to contain lead shot for adjusting purposes, and below this is a rubber cushion.

The only novelty here seems to be the 'U' shaped beam. Presumably, this was to achieve lightness and reduced cost. No example has been seen by the author.

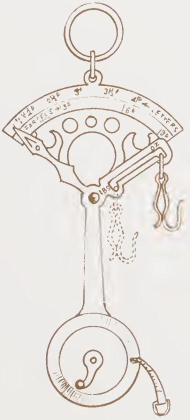
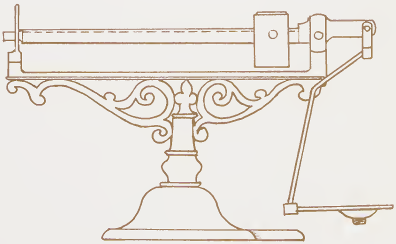


FIG 43. (left); Ragg's combined measuring tape and pendulum balance for parcel post. The clip/hook has two pivot positions, for letters or parcels.

FIG 44. (below); Watson's counter steelyard with a rubber bumper below the letter plate!



ISASC

EQUILIBRIUM®

QUARTERLY MAGAZINE OF THE INTERNATIONAL SOCIETY OF ANTIQUE SCALE COLLECTORS

1983-ISSUE NO. 2

PAGES 541-568

Cover Picture

This Hungarian ducat scale was made by Paulus Deinert, in Nuremberg, between 1758 and 1783, when he died. It is a fascinating combination of equal-arm two-pan balance and 'pendulum' or inclination balance. The left pan is heavier than the right pan by an amount equal to the weight of a gold ducat, so no weights are needed (the label starts "Ein Waglein ohne Gewicht" - a little scale without weights). If the coin is underweight, the beam comes to rest in an inclined position, and the amount underweight is indicated on the quadrant fixed between the pointer and the beam.

Paulus Deinert's sign was an ostrich below his initials from 1747 until 1758, then he adopted the cupping-glass sign previously used by his brother-in-law, Johann Loss. The cupping-glass can be seen at the top of the label and in the left pan, in the Cover Picture.

Paulus Deinert also made equal-arm scales of conventional design, with square coin weights, and grain weights, in a cut-from-solid wood box.

These biographical details, and much more about other Nuremberg makers, can be found in Hermann Lockner's book, reviewed on page 557.

OBITUARY

The death occurred, recently, of centenarian Richard Turner. One time Alderman and Mayor of Bedford, England, he was well known to readers of Libra magazine, for his interesting contributions on English money weights and trade weights. He was a good friend to many collectors and his kind tutelage will be much missed.

INTERNATIONAL SOCIETY OF ANTIQUE SCALE COLLECTORS
Founded September, 1976
20 North Wacker Drive • Chicago, IL 60606 • U.S.A.

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George Salter & Co (Part 2)

MICHAEL CRAWFORTH

Towards the end of the 19th century, Salter encountered considerable difficulty in getting the spring balance accepted as an accurate weigher for trade. It was a period when the authorities were demanding improved standards in weighing apparatus, and some Magistrates were fining traders for using spring balances instead of the traditional scales and weights. After much correspondence with the Board of Trade and demonstrations showing how reliable and accurate Salter spring balances were, the firm achieved full official approval of their instruments for trade use. Similar problems occured in other parts of the world, but a visit from Salter's representatives soon convinced Ceylon and Canada, for example, that Salter spring balances were fully satisfactory. Some countries, like Tanganyika and Indonesia, even passed laws permitting only Salter's spring balances to be used.

Another unusual product was added to the Salter repertoire in 1895, when the firm started making the first English typewriter. It remained one of the company's products until 1936, when the typewriter department was detached to form a separate concern

In 1915, Salter's became a Limited company, and the abbreviation LTD was used after their name, although on many spring balances they continued to use just SALTER and the trade mark. It was war time, and, like every other engineering firm, non-essential products were dropped to concentrate on helping the war effort. Millions of springs were made for military vehicles and weapons. Many scales were supplied to the armed forces, and ordnance factories were supplied with balances for weighing shells. Included among these wartime products was an instrument for testing and adjusting the spring firing mechanism of the Lewis gun. This testing instrument is now often mistaken for a scale because of its graduations in pounds, but it is, in fact, a tension tester, Fig 51.

After the war, in the 1920's, Salter's home market was menaced by large imports of inferior cheap balances from abroad, which, because they were inaccurate, meant that ALL spring balances were again treated with suspicion. Once more Salter discussed the problem with the Board of Trade and the result was a new regulation which required every imported spring balance to be marked with its country of origin.

Between the two world wars, there were several new developments. A compact bathroom scale was patented with a mirror to enable the person to see the dial, Fig 57. New low-format kitchen scales were patented with a horizontal rotating dial of conical form, tilted upwards to face the user. The Salter milk recorder was devised, and egg balances of various designs came into the product range, which now included testing machines for cement, foundry sand and cotton, rain gauges, crane weighers, safe-load indicators for cranes, and a 'pocket weighbridge' for weighing trucks up to 10 tons. There were also many miscellaneous products too numerous to mention here. Salter also co-operated with W.& T. Avery Ltd, to produce the Avery-Salter bacon pig weigher. This was just one of a whole range of balances for farm use. So much business was done at agricultural shows that Salter fitted-up a van as a travelling show-case, to display all their products for use on the farm or in the home. It was in the 1930's that traditional methods of making many products had to be abandoned. In 1934, flow-line methods were introduced and some scales were made in large numbers, for example the production of balance No.46, a kitchen scale, was stepped-up to 1,000 per day. Even before the wars, competition for the market in kitchen scales was strong, with many imports from abroad, and especially from Czechoslovakia. That country exported to Britain a cheaply-made, low-priced but attractively decorated spring kitchen scale, Fig 46. In order to compete, Salter made their own version, which strongly resembled the import. It was advertised, in 1913, with the comment "To meet foreign competition", Fig 48.

Salter balances were used all over the world to weigh all manner of things; in South and East Africa, cotton and coffee beans; in Nyasaland, tobacco leaf; in Nigeria, cocoa beans and palm kernels, ground nuts and cotton; in the Sudan, India and Ceylon, cotton; in India, Indonesia and Ceylon, tea, (the balance being made with special forks to hold the conical tea baskets); in Trinidad, sugar cane; in every dairy country - Australia, New Zealand, South Africa, milk; and in ports all over the world, the Salter crane weighers were in use.

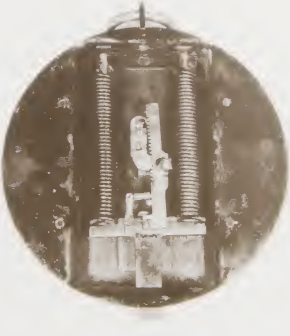

FIG 33. Interior of a milk balance c1920. The toothed rack is pulled down, from below, to rotate the pinion driving the pointer. The hook was attached to the T-shaped bar which connects the twin springs at the bottom. This simple system was based on circular balances of the mid 19th century.

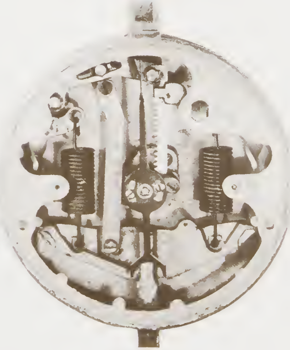

FIG 44. A more complicated mechanism used in circular balances of the 1960's. The rack is operated from above, by levers which magnify the motion of the T-bar below it, and permits manufacturer's adjustments. The left spring is anchored to another lever used to adjust the balance for the tare weight of a container.

Today, Salter continues to produce a wide range of products, including spring balances for all kinds of weighing. In 1973, the Abbey Manufacturing Co., makers of the Little Samson spring balance, was taken over by the company to form Salter-Abbey of Bury St.Edmunds. It is the wide range of purpose for which Salter balances have been made, and for which many specialised goods fittings were devised, that forms the major interest for collectors and students of old weighing apparatus.

Dating old Salter balances is not always straight-forward. Many old designs were made for long periods concurrently with improved designs, which, logically, one would have expected to replace them. The example of the flat straight face balances has already been mentioned. Another one is the early pocket steelyard of the 18th century, with its iron tube enclosing the spring and a graduated slide which pulled out of the top, Fig 11. It was still illustrated in the catalogue of 1908. By that date, the superior tubular brass balance with an indicator in a slot, and the flat-face balance had been in production for many decades. A nickel-alloy version of the pocket steelyard was still made for sportsmen's use, in the 1960's, and today, a plastic tubular version is the "latest thing" available from Salter-Abbey, Fig 55.

The dates given in this article have been compiled from original research by the author and from old Salter records.

Continued ▷

ACKNOWLEDGEMENT

The author thanks Alistair Middleton for his kind help in supplying information and for making the Salter archives available for study.

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4. BRITISH PATENT RECORDS.
5. MIDDLETON. A. Currently working on the history of Salter.

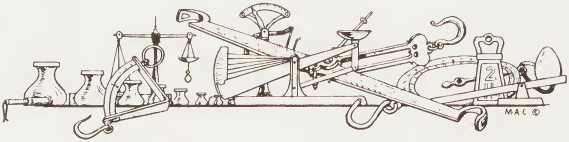


FIG 35 Dynamometer for testing the strength of the hand, from the 1893 catalogue. The handles are squeezed together to register the gripping force.

FIG 36 Counter scale for butchers, fishmongers, greengrocers etc., 1912. Capacity 20 lb x 1 oz. It was available with one or two dials (the second facing the customer), and in a bronze finish or nickel-plated.

FIG 37 "Combination Postal Tape and Scale" made to Tozer's patent of 1883 and still shown in the 1893 catalogue. For further details, see EQM pages 537 & 538.

FIG 38 Counter scale No.105 made to Webster's patent of 1855. This illustration is from the 1893 catalogue. It was available with capacities of 15,30,60 or 120 lb. A different decorative style is shown in the 1912 catalogue. It had a glass face and was finished in black with gold highlights.

FIG 39 Person scale No.150, made in mahogany with a brass pillar and brass chair-arms. The seat was upholstered with velvet. Capacity 0 - 30 stones x 1 lb. Dial diameter 458mm (18").

FIG 40 Dynamometer for testing a person's lifting capacity. The handle was moved up or down to a convenient height. Then, standing on the footplates provided, the handle was pulled upwards. The maximum force achieved was recorded by the second pointer.

FIG 41 Jockey scale No.158, available with a plain mahogany chair, mahogany with brass arms, or mahogany with a cane back, as shown. Capacity 20,30 or 40 stones x 1 lb. Graduated in Stones and Pounds. Illustrated in the 1893 catalogue.

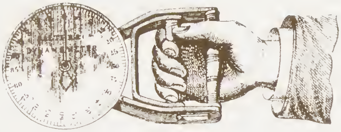
FIG 42 Platform scale No.112, from the 1893 catalogue, for use in warehouses, factories, etc. Capacity 3,5,10 or 20 cwt. Cast iron. Available with a brass face, or a white enamelled face with a glass cover.

FIG 43 See page 548.

FIG 44 "Autoway" postal scale, No.30. Registered in 1933, No.783591. Graduated 0 - 16oz x ¼oz. Painted red; small parts chrome-plated. Postage rates printed in black on silver paper under a glass cover on the letter plate. In the 1950's, a curved plate was available for weighing rolled papers, etc. Height 200mm (7.9").

FIG 45 Diet scale No.18D - a version of the bow-front letter balances shown on page 527, Fig 28. Apple-green painted case; lift-off aluminium pan. Graduated on the left 0 - 8oz x 1/3oz and on the right 0 - 8oz x 1/4oz. Height 110mm (4.3"). Pan dia. 127mm (5").

FIG 46 "The Pearl" household scale "Made in Czechoslovakia". Cast iron case painted turquoise with gold decoration. Tin-plated lift-off pan. Graduated 0 - 25 lb x 2oz. Height 320mm (12.5"). This scale, and similar imports gave Salter strong competition in the early 20th century. Compare with Fig 48.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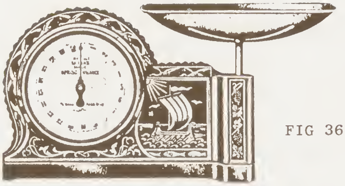
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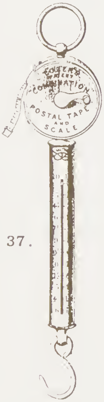

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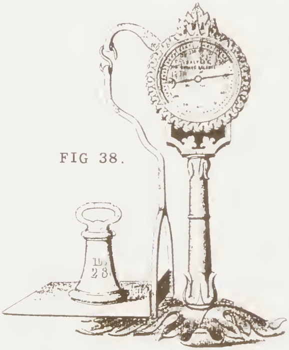
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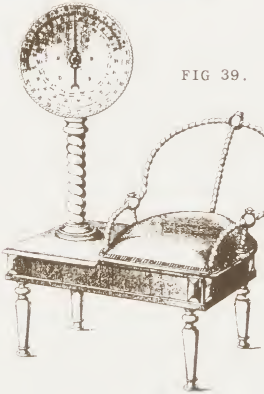
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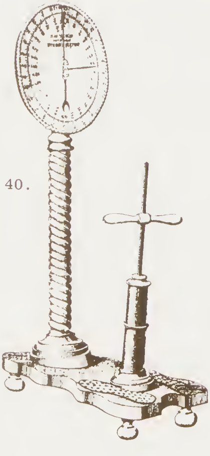
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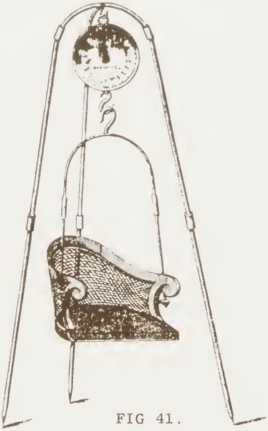
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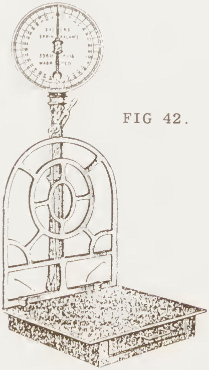

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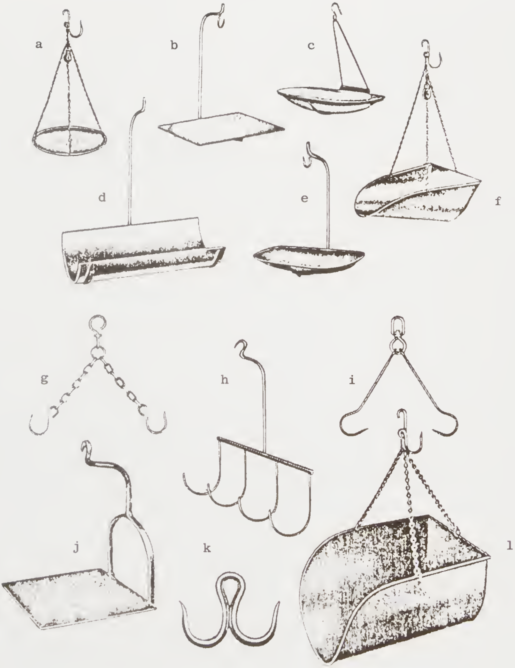


FIG 43. The large range of standard fittings available for use with Salter trade and industrial balances. Special fittings are made to order.

a) Round pan - general purpose.
b) Flat plate - general purpose.
c) Oblong pan & folding hanger.
d) Semi-circular 'lap scale' - bales of straw.
e) Oblong pan - fishmongers, greengrocers, etc.
f) Scoop - fruiterers, greengrocers.
g) Chains & hooks - coal sacks.
h) Iron frame - bars of metal.
i) Long hooks - hay.
j) Flat plate - general purpose.
k) Double hook - butchers.
l) Large scoop - coal.

GEORGE SALTER & CO. BRITISH PATENTS, CLASS 143.

1838	Jul. 9	7724	G.Salter.	Indicators for spring balances.
1855	Jun.16	1374	J.Webster.	Dial-face counter scale.
1859	(Design Registn.)			Dial-face bal.springs exposed.
1861	Apr.13	909	J.Silvester.	Quadrant bal.& Dial-face bal.
1861	Aug.14	2025	T.Silvester.	Spring attached top of slide.
1862	Jan.31	255	J.Silvester.	Straight-face bal. with no case.
1867	Jan.11	68	J.Silvester.	Top-pan, dial-face, half-rob.90°
1877	Dec.28	4918	T.B.Salter and J.Hughes.	Straight-face bal. spring anchor. sheet metal construction.
1883	Aug.18	4009	W.Tozer.	Straight tubular bal. Tape measure.
1883	Sep. 3	4228	G.Salter and J.Hughes.	Platform scale, dial-face.
1884	Dec.13	16433	P.Everitt.	Coin-freed person scale.Printout.
1887	Jul.22	10255	G.Salter and J.Hughes.	Indicator with shock protection.
1889	Aug.22	13260	P.Everitt.	Improvements to coin-freed mech.
1902	May.17	11394	G.Herbert.	Sight-hole indicator for slide.
1903	Mar.21	6578	J.Hughes.	Crane scale. spring washers.
1905	Mar.14	5289	G.Salter.	First graduations omitted.
1906	Dec. 1	27371	G.Salter and J.S.Foley.	Pendulum bal. equal graduations.
1907	Mar.15	6292	G.Salter and J.R.Hughes.	Tubular bal. & tension tester.
1913	Nov.25	27075	R.F.Hall.	Person scale. footplates on pillar.
1922	Jul.22	195576	G.Salter & Co.Ld. & E.W.Bache.	Fan counter scale. damper.
1922	Jun.17	202109	G.Salter & Co.Ld. & E.W.Bache.	Relieving & locking mechanism for platform scale.
1926	Jul.23	270922	G.Salter & Co.Ld. & J.Hughes.	Dial-face bal. Multiple springs with independent adjustment.
1928	Jan.24	302514	G.Salter & Co.Ld. & E.W.Bache.	Person scale with mirror to view dial face.
1932	Nov. 2	402930	G.Salter & Co.Ld. & E.W.Bache.	Top-pan kitchen scale with horiz. rotating dial.
1932	NOV. 2	408717	G.Salter & Co.Ld. & E.W.Bache.	Top-pan bal. leg guided by rollers.
1933	Sep.21	427390	G.Slater & Co.Ld. & F.Wyatt.	Mechanism to provide expanded graduations for 1st 2 lb of 14 lb.
1948	Jun.21	642224	G.Salter & Co.Ld.	Dial-face, integral cast numbers.
1949	Feb. 9	657716	G.Salter &.Co.Ld.	Platform on balls & inclined plane.
1949	Oct.31	659716	G.Salter & Co.Ld.	Top-pan, inclined dial-face.
1954	Feb.23	726035	G.Salter & Co.Ld.	Leaf-springs as stays for top-pan.
1955	Mar.21	758544	G.Salter & Co.Ld.	Flat bathroom scales, plate springs.

The above list is a selection of patents of interest to collectors of small and medium-sized scales, up to 1955. It includes some patents by people not in Salter's employ, for which they obtained manufacturing rights.

FIG 47 This type of hand-held letter balance was made during the first postage-by-weight period, 1840 - 1865. It was still available in catalogues of the 1930's, with appropriate postage rates. The wire stands, iron or brass, were shown in the 1893 catalogue.

a) Letter balance with brass wire letter rack. Graduated 0 - 4oz. Height of face 90mm (3.6").

b) Letter balance with combined pan and wire letter rack. Graduated 0 - 16oz. Height of face 118mm (4.6").

FIG 48 Salter's Household scale No.49, introduced to compete with imported scales, like the one shown in Fig 46. It was advertized in 1913 "To meet foreign competition". Graduated 0 - 20 lb x 1oz. Lift-off tin-plated pan; cast iron painted dark green with gold decoration. Height 320mm (12.5").

FIG 49 Letter balance made in the style of a fountain pen. Plastic mock tortoiseshell case. Nickel plated metal parts. Graduated 0 - 8oz with postage rates for 1940 - 1952. Length, with cap, 127mm (5").

FIG 50 Post Office parcel balance marked GPO. Graduated 0 - 11 lb with postage rates for 1923 - 1935. Sturdily made in brass with a tubular slide. Contained in a tin-plate case also stamped GPO. Height of face 118mm (4.6").

FIG 51 Tension tester for use with a Lewis gun in the First World War. The spike and 'screwdriver' ends were tools for making adjustments. The cord loops are original. Graduated 0 - 20 lb x ½ lb. Length of body 72mm (2.8"). This instrument is often mistaken for a scale.

FIG 52 Salter started making egg balances in the 1930's. They made a variety of designs, and those shown in the illustration, c,d,e,f and g, all had the designation No.18E.

a) Egg balance No.9E, either hand-held or on a stand. Graduated 0 - 4oz x ¼oz. Shown in catalogues of the 1930's. Length of face 74mm (3.5"). Pan diameter 74mm 2.9").

b) Dial-face egg balance for trade use, No.11ET. Graduated 0 - 8oz x 1 dram. Dark green painted cast iron case; white face; brass egg cup. Introduced in the 1930's and still available in the 1950's.

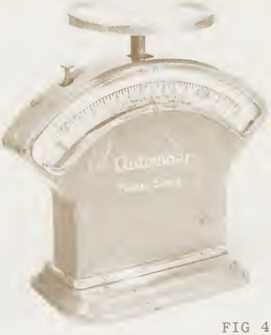
c) Bow-front egg balance with a bronzed finish. Aluminium pan. Shown in catalogues of the 1930's. Graduated 0 - 4oz x ¼oz. Height 98mm.

d) Bow-front egg balance. Case painted dark green; brass egg cup; white face. Graduated 0 - 4oz x 2 dram, with grades marked for duck eggs and hen's eggs. Height 124mm (4.9").

e) Bow-front egg balance with a bronzed finish. Aluminium pan. Graduated 0 - 4oz x ¼oz. Height 110mm (4.3").

f) Bow-front egg balance. Case painted apple green; brass egg cup. Graduated 0 - 4oz x 2 dram. Also available 0 - 150gram x 5g. Height 118mm (4.6"). This flat-based version was introduced in the 1950's.

g) Bow-front egg balance with a gray plastic case, and brass egg cup. Graduated 0 - 4oz x 1/8oz. Face slides up/down for adjusting to zero.



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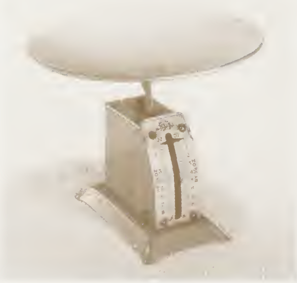

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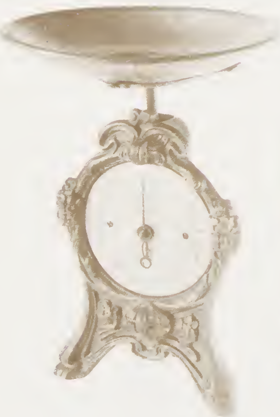

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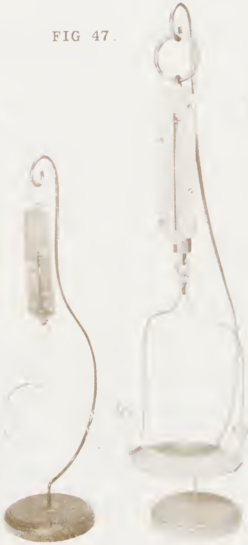

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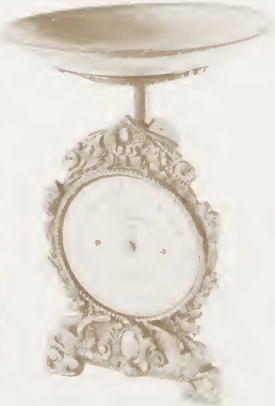

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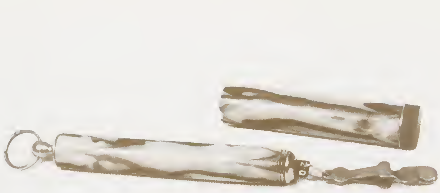

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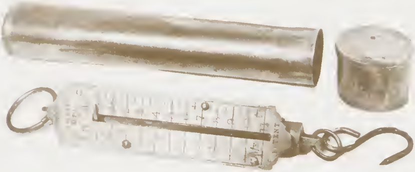

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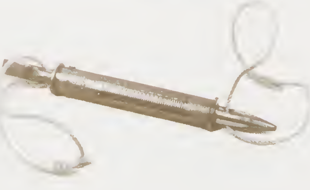
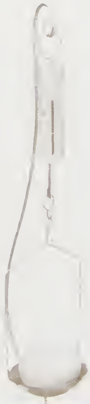


FIG 52, a to g.



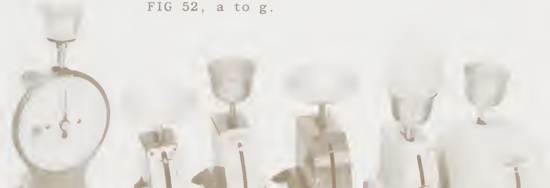


FIG 53 Sportsman's balance No.15. Brass tubular body with an aluminium handle. The balance slides to the end of the handle which folds down to make a compact 'package' for the pocket. Graduated 0 - 20 lb x ½ lb. Length of body 81mm (3.1"). Available with capacities from 1 lb to 60 lb.

FIG 54 Jeweller's balance with black anodized loop, hook and zero adjustment knob at the top of the body. Shown in the 1980 catalogue. Graduated 0 - 10 oz Troy x 1/10oz. Length of the brass tubular body 130mm (5.1").

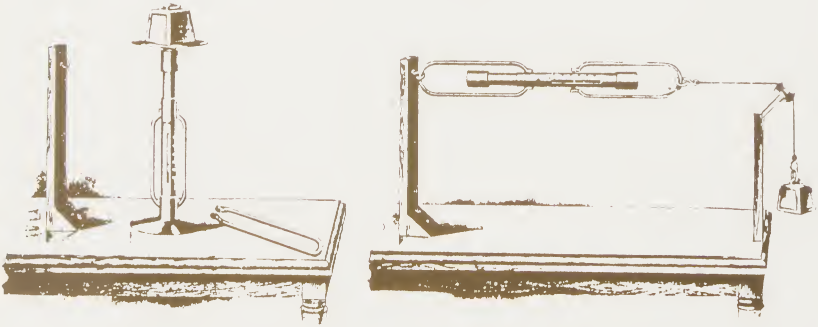
FIG 55 "Super Samson" balance made by Salter-Abbey. Black plastic body; silver-coloured plastic face and label. This recently introduced design returns to the old 'pocket-steelyard' idea of a pull-out graduated top. Graduated 0 - 200g x 2g. Also available graduated in Newtons, for laboratory use.

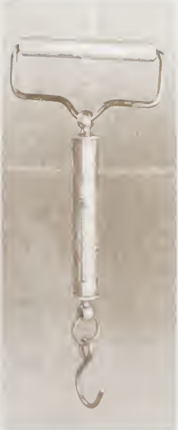
FIG 56 "Pocket Balance" No.3, with grey painted case and aluminium face graduated 0 - 56 lb and 0 - 25 kg. Zero adjustment screw at the top. Length of body 112mm (4.4). Shown in catalogues of the 1960's.

FIG 57 "Belmont" bathroom scale patented in 1928. Cream painted cast iron case. The mirror shows the dial to the person standing on top. It folds flat against the case for storage. The figures on the dial are printed backwards, and the pointer rotates anti-clockwise, to give the correct image and clockwise rotation in the mirror. Graduated 0 - 20 stones x 1 lb. Height 210mm (8.2").

FIG 58 "Carlton" bathroom scale, No.217. patented in 1913. White-painted cast iron case. Footplates are fixed to the telescopic pillar. The horizontal dial face is graduated 0 - 20 stones.

BELOW Combined tension or compression tester and spring balance. Left: the instrument in use as a 'candlestick-type balance'. Right: The scale pan and base removed, and the instrument indicating tensile stress. Illustrations from the 1912 catalogue.





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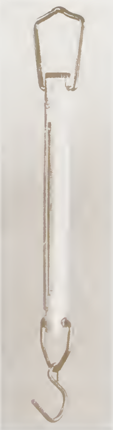

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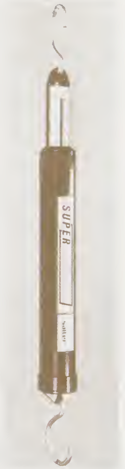

FIG 55.

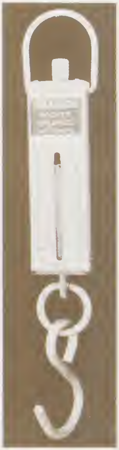

FIG 56.

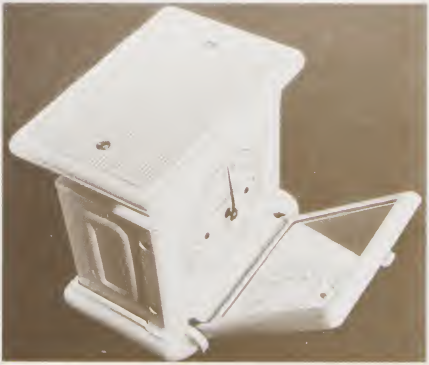

FIG 57.

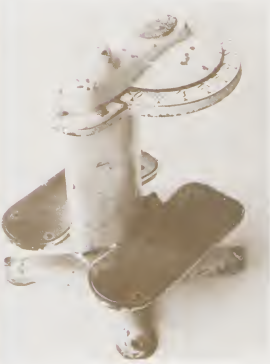

FIG 58.

LOS ANGELES-COUNTY-DEPARTMENT OF WEIGHTS AND MEASURES

THESE PICTURES SHOW THE DESTRUCTION OF SEVERAL THOUSAND FALSE AND INCORRECT WEIGHING AND MEASURING DEVICES, CONDEMNED IN THE CAMPAIGN FOR HONEST WEIGHT AND MEASURE

LOADING THE TRUCK WITH CONDEMNED SCALES AT OUR WAREHOUSE

TRANSFERING THE SCALES FROM THE TRUCK TO THE BARGE AT LONG BEACH

OUTSIDE THE BREAKWATER OFF LONG BEACH

DOWN THEY GO, TO DAVY JONES' LOCKER

Contemporary Comment

Review

BALANCIERS: ETALONNEURS - LEURS MARQUES, LEURS POINÇONS

(Scalemakers: Inspectors - Their Mastersigns, Their Stamps)

The idea of compiling this book was excellent. Written in French, it brings together information from a number of sources, along with the author's substantial research, to cover most of the countries of Western Europe. There are illustrations of over 200 marks from 16 different countries, with charts of date stamps and an alphabetical list of scale and weight makers, adjusters and inspectors, with a cross-reference system. There are also 27 black-and-white photographic or engraved illustrations of attractive scales and weights or their makers, taken from previously published sources. It is an impressive volume of 217 pages, in A4 size, with soft covers and produced by good quality electrostatic copying.

On closer examination, it was disappointing to find that many of the British and Irish entries contain mistakes. Consequently, it is difficult to review the book in the light of the recent death of its author. However, I feel that in the interests of scholarship, the criticisms should be made to help readers to assess the reliability of the book. I must stress that I can only comment effectively on the British and Irish entries, which constitute about 15% of the work.

In 464 British and Irish entries there are 279 errors. Most of them are simple proof-reading mistakes and mis-quotations, but there are 37 major errors of fact and important omissions of evidence available to the author from the references cited. To give just a few examples; two place names, Middleton and Ashton (under Whitley) are presented as maker's names; some dates are wrong by many years - Samuel Read worked from 1735 - c1781 (not 1690, as stated); the Westminster portcullis mark is shown upside-down and called the mark of the Board of Trade; Barned & Co. of No.2 Lord Street, Liverpool are given the address "Londres, Lord Street No.2"; John Brerner's name is given as Berner and so is wrongly placed, alphabetically; the English abbreviation Jno. for John is written out as "Junior"; under Francis Gray, three other makers are said to work at the same address. In fact, they worked at totally different addresses scattered all over London. In the bibliography, there are at least 30 errors or ommissions, six of which would make it difficult to trace the works in a library. And why did Lavagne omit so many makers from the books he gives as references?

I sincerely hope, that after so much hard work in preparing this book, that entries for other countries are accurate. Members of the Société Métrique de France consider that the French section is valuable, even though that section, too, includes many minor errors. As an author myself, I know it is impossible to achieve total accuracy in a work of this kind, but the number of mistakes should be lower than in Lavagne's work. The problem with such a high proportion of errors is that one loses confidence in the other entries which one cannot check. Verifying his facts is particularly difficult because in his Répertoire Alphabétique, Lavagne rarely provided the specific sources of his material. Fortunately, he did give references for the majority of drawings in the section Marques et Poinçons. Most of these marks are superbly drawn and clearly presented. Their division into national groups makes access easy.

BALANCIERS: ETALONNEURS - LEURS MARQUES, LEURS POINÇONS by F.G.Lavagne, Montpellier, 1981, was produced in a limited edition. A revised version is being planned by members of the Société Métrique de France. Correction of the errors will make this a most important work.

THE WEIGHING OF MONEY

In this little book, the author courageously set out to cover the weighing of money from antiquity to the twentieth century in only 66 pages. He has been remarkably successful. It is an excellent summary of the scene, full of useful facts, profusely illustrated, well arranged and nicely printed in English.

Many weights are shown and identified, and the author refutes the claim that some early glass objects are coin weights. With great clarity, he discusses mass, design and nomenclature, drawing our attention to problems that collectors should be discussing.

The second half of the book is devoted to boxes of scales and weights, banker's weights and all kinds of counterfeit coin detectors (including some American examples). Some very rare, unusual and fascinating scales are illustrated, and their characteristics and use are briefly explained.

There are a few errors in the caption dates and no reference to the sovereign weights made by the Standards Department, in England, in the 1870's. The survey chart is misleading. For example, it omits some common characteristics of English coin weights; and his remarks about coin weights for English silver money are inadequate because there were many weights made in the 1690's when coinage was in a terrible state. BUT, these little criticisms refer to a very small percentage of the book.

Once again, Gerard Houben has produced an important and attractive book, essential reading for everyone with an interest in coin scales and weights. It will be more than a constant source of reference, it will be a pleasure to browse through and an inspiration for collecting.

'The Weighing of Money' by Dr.G.M.M.Houben. 1982. Written in English. 66 pages; over 250 weights and 58 scales illustrated. Available from the author at Hugo de Vrieslaan 12, 8024 BM Zwolle, The Netherlands. Price £7 or FL 32. Post Giro 415559.

DIE MERKZEICHEN DER NÜRNBERGER ROTSCHMIEDE

(The Mastersigns of Nuremberg Coppersmiths)

Hermann Lockner has compiled a definitive catalogue of nearly 2000 Nuremberg coppersmiths from the official records. It includes over 230 weight and scale makers who were members of the guild of coppersmiths. The entry for each maker includes dates, trade, family relationships, mastersigns and record sources, wherever these are known. An excellent cross-reference system enables the reader to trace makers from the charts of mastersigns or the list of initials, or from the comprehensive name index. The mastersigns are conveniently compiled in groups according to their design - animals, weapons, birds, and so on, and the design and chronology are discussed in detail.

Scholars and authors will find this book a model for the presentation of a difficult subject with thousands of facts. Readers will find it simple and convenient to use - an essential reference source for all researchers and collectors with an interest in Nuremberg weights and scales. As it is largely a catalogue, non-German readers will find it easy to translate the few short headings necessary to consult the lists.

'Die Merkzeichen der Nürnberger Rotschmiede' by Hermann P.Lockner. Deutscher Kunstverlag, Munich, 1981. ISBN 3-422-00703-2. Written in German. 329 p. 534 drawings of mastersigns.

Showcase

1. Grocer's or confectioner's stand scales, marked W.G.Perry & Son, 391 High Road, Ilford. Brass pillar and scales, mahogany base. Brass weights.

LOU UIT DEN BOOGAARD COLLECTION

2. Chemical scales, marked RICTUS DRP 384478 on the front and M in a square 'star' on the back. Brass pan and case; black painted metal base. Graduated 0 - 500g, with expanded divisions up to 100g.

DIRK SCHMITZ COLLECTION

3. Butcher's scale by the Computing Scale Co. Dayton, Ohio, USA. "Pat. Apr. 24, 1900; Mar.27, 1906; May 19, 1903. Brass side beam; brass scoop on a marble goods plate; decorated brass cover plates. Capacity, 10 lb on the fan chart plus 10 lb on the side beam. On the user's side, the chart has weight across the top, price per pound down the side, and across the chart is the computed price for the indicated weight of goods.

WAYNE ROBERTS COLLECTION

4. Customer's view of the butcher's scale shown in Fig 3, showing the weight only, across the top. The manufacturer's monogram CSCo is incorporated in the decorative design of the cover.

1

2

SHOWCASE

3

4

Letters

From Dr.Ing.G.M.M.HOUBEN.

I have several remarks related to the recent article on Guinea weights: (Numbers on left refer to illustrations on EQM pages 459-466, 495-504 - Ed.)

No.1: I am enclosing a photograph of my example, Fig 1. The quarter also exists in the same design.

No.3: During James II reign, coin weights were made for the old Unite of previous monarchs, and for the current guinea. The old unite weight which you show, has a mass of 9.1g, shows the king's head facing right and has XXs or XXIIs on the reverse, whereas the guinea would weigh 8.38g, show the king's head facing left and have GUINEA W on the reverse,(See my book, note 22, page 15)*

Nos.5/10: William III weights also exist with GUENEA on the obverse and a different design on the reverse, Fig 2.

No.12: I have another design which is shown in Fig 3.

No.13: This weight was only from Cologne and Belgium - Dieudonné was wrong. (Also, his Nos.19,22,24 are for coins of the Low Countries)

No.14: This is also known with the date 1760. There is a version with James Warren's initials JW-WJ, also dated 1760. Halves are known, marked 2.13. I have a similar weight with the intertwined initials TP-PT, by Thomas Price, Fig 4.

No.16: Kirk also made this with HALF A GUINEA only, on the reverse. The same design was made with the initials T.N and ONE GUINEA WEIGHT on the reverse. My Kirk has I.K. under the bust and GEORGIUS II D.G.REX.

No.20: My example has the date 1755.

No.22: This exists with $\frac{D}{5}$ $\frac{G}{6}$ and also with larger figures on the reverse. A similar type has on the reverse GUINEA WT 1775, Fig 5.

No.27. I have a similar example, but with I.K., and the reverse without the year, but with a broader rim.

No.61: In a similar style, I have a 10s, which could be for a light half-guinea, Fig 6.

No.89: In this series, I have the quarter guinea and 7s piece, Fig 7.

Nos.115 & 116: The weights by Abdy are known with three different obverse designs. With a rose above the castle; with a crown; with nothing above the castle. They exist for the 5.8 and 5.6 standards.

Some other interesting weights are shown in Figs 8 to 12.

GERARD HOUBEN

REPLY

I am indebted to Gerard Houben for the two corrections and his interesting additional information. My No.3 has a mass of 8.35g, the weight of a guinea in James II reign. However, on closer examination I see it has been filed.

** European Coin Weights for English Coins. EQM p.66.*

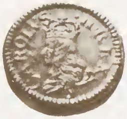
FIG 1.

FIG 2.

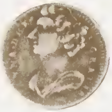
FIG 3.

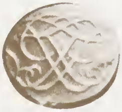
FIG 4.

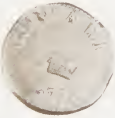
FIG 5.

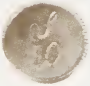
FIG 6.

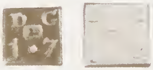
FIG 7 a,b.

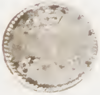
FIG 8.

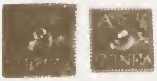
FIG 9 a,b.

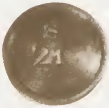
FIG 10.

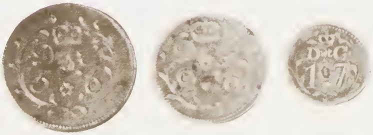
FIG 11 a,b,c.

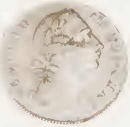
FIG 12.

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from R.RIX Dipl.Ing.

The recent Swiss stamp issue combines my two hobbies (I collect stamps in addition to scales and weights). According to the Postal Authorities - "This delicate letter balance, of hardwood and brass, was made at Basle between 1820 and 1830, and it is now in the PTT Museum's postal collection. Finely shaped and yet robust, it testifies to the craftsman's great skill. It is 200mm high and has a round base 110mm in diameter. Its double scale ranges from 0 - 3 loth (1 loth = 1/32 of a pound) and from 0 - 45 grams. It could thus be used both in the Swiss cantons, where the old weights and measures predominated until the 1860's, and in France, which had introduced the metric system in the Revolution. The Swiss postal system changed over from Loths to Grams in 1862, after the Federal Postage Rates Act."

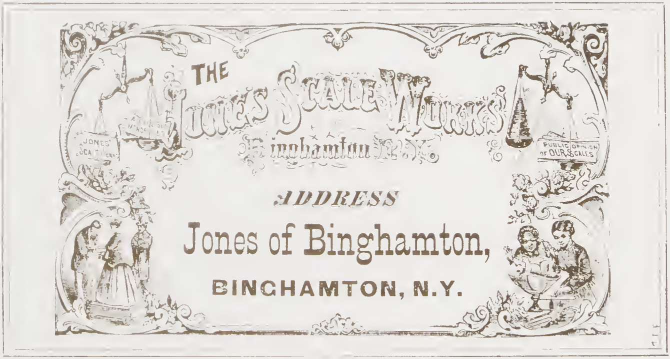
This indicates that the metric system had already been introduced by the Swiss postal authorities in 1862. The metric system was permitted to run parallel with the old system of weights from 1868 until the general introduction of the metric system, by Federal law, in 1875. From the 1st

January 1877, all Swiss cantons had to use only the metric system.

By the way, the pound was re-defined as being 500 grams, in eleven of the cantons of Switzerland, between 1820 and 1835, but with sub-divisions still in old units, (i.e. unze, loth, and so on.).

REINER RIX

Old Advert



THE JONES' SCALE WORKS
Binghamton N.Y.

ADDRESS
Jones of Binghamton,
BINGHAMTON, N.Y.

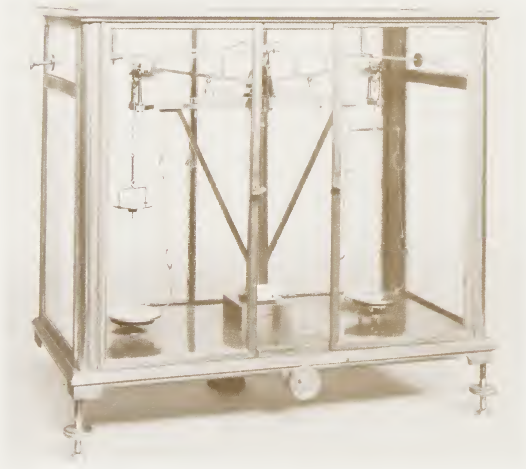
JONES' SCALES
PUBLIC OPINION OF OUR SCALES

What were "All the old monopolies" ?

The Editor is indebted to Tod Carley for this extract from the Jones' catalogue of c.1885.

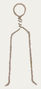
Precision Balance 2

HANS JENEMANN



Rueprecht of Vienna made this analytical balance, c1885. It is the 'simple' type of instrument which uses a long beam. By the end of the 19th century, the long beam had mostly been superseded by the short beam.

When using the balance, weights are placed in the right pan to approximately counterbalance the load in the left pan. Then the case is closed and fine weighing is completed by using the two rods which project through the sides of the glass case. By manipulating a rod, a tiny wire rider-weight can be positioned anywhere along the graduations on the beam. The use of two rods, one for each arm of the beam, is unusual. Most precision balances had one rod to manoeuvre a rider weight on the right arm of long beam balances, or on both arms of short beam balances.



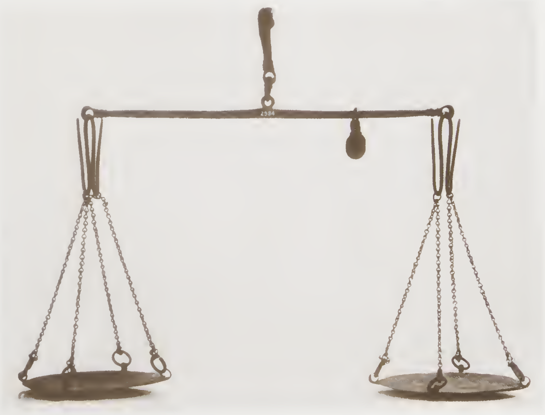
Rider-weight full size

In addition to the normal pans, a small pan with a hook underneath is provided for hydrostatic weighing. When in use, the small pan replaces the large pan on the left, the mass of each being identical. A knob at the front of the case operates the relieving mechanism which protects the bearings.

The instrument is mounted on a wooden base, and the handsome glass case has a slender brass frame. Size 480 x 250 x 520mm high (18.9 x 9.8 x 22.8 ins). Beam length 320mm (12.6 ins). Capacity 200g with a sensitivity of 0.1 mg.

The rider-weight has an uncertain history. Credit for its invention is often given to the famous Swedish chemist, J.J.Berzelius, but, in his chemical textbook of c1830, Berzelius, himself, said the inventor was J.G.Gahn (1745 - 1818) another Swedish chemist. However, in 1930, it was pointed-out by Max Speter, that Joseph Black (1728 - 1799) the great Scottish scientist, had used rider-weights some years before Berzelius or Gahn. BUT, all these were re-inventions, long preceded by the Romans ! The Roman bronze balance shown below has a rider weight suspended from the graduated arm of the beam.

Manipulation of the rider-weight from outside the case was first achieved by C.A.von Steinheil, according to a report of 1837. But, Ludwig Oertling of London, exhibited a precision balance with an externally controlled rider-weight at the Great Exhibition of 1851. He is usually given the credit for the first commercially produced balances of this type.



No.1772.3-19.2. Hamilton Collection. Reproduced by permission of the British Museum, London.

CYRILLIC LETTER

Carl Mönnig has sent the following correction to his article on Page 278, RUSSIAN NESTING WEIGHTS, line 12 No. 6. -

The mark **3** is not a number, or an ordinal number. It is the Cyrillic letter for S, the abbreviation for SOLOTNIK.

Patent Postals

MICHAEL CRAWFORTH

A SURVEY OF POSTAL SCALES PATENTED IN BRITAIN, 1840 TO 1940.

1886 22 Jun. No. 8247. J.GREENBURY See Fig 45.

A tubular metal holder has at one end, a spring balance, and at the other end, a combined pen and pencil which may be pulled out, turned around and reinserted, according to the end required. Weight indication is either by a pointer in a graduated slot in the holder, or by a graduated tube around the spring, which is pulled out of the holder.

Another of the writing/weighing compendia. Postal purposes are not mentioned by the patentee, but all others of this type were for letters. No example has been seen by the author.

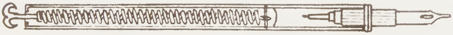


FIG 45. Greenbury's combined pen/pencil/ letter balance.

1887 4 Jul. No. 9450. C.W.BLACKLOCK & M.HYNES See Fig 48.

Spring balances for weighing parcels are marked with postage rates for different distances corresponding to each unit of weight.

The abridgement illustrates a circular dial divided into many sections. The text outlines an alternative straight-face balance with similar rates in parallel columns. No examples have been seen by the author.

1888 6 Jan. No. 232. J.C.WATKINS, M.& J.FIDLER See Fig 46.

A roberval postal balance has a suspended cross-bar in place of the normal weight plate. The cross-bar passes below a series of weights supported at slightly different levels by a stepped block. When the scale beam rises, the cross-bar collects weights, in succession, until the load is balanced. A board graduated with weight and postage rates, is attached to the end of the beam and rises with the beam past a pointer fixed to the frame of the instrument. A small weight plate attached to the top of the board can be used for adding loose weights for more accurate weighing.

The drawing in the abridged patent specification shows a view looking at the end of the twin roberval beams, represented by black rectangles, Fig 46. Weights are shown with conical ends to locate them in holes in the block, and the graduated board is shown at the top centre, projecting through the case of the instrument. Although the details of the design are not very clear, the principle is straight-forward - another variation of the weight-collecting beam. No example has been seen by the author.

1888 15 Jun. No. 8797. F.H.SMITH See Fig 47.

An unequal-arm beam with a fixed weight, has a vertically deep flat beam. A slot pierced through the beam has notches at intervals corresponding with weight values. A letter plate is suspended from a loop passing through the slot, and can be moved to the desired notch.

This is an unusual design where the weight and fulcrum have fixed positions and the load is moved along the beam to achieve a balance. Consequently, it shares some characteristics with bismars and steelyards. By making the slot in the form of a 'U' the patentee was able to use each arm of the U for different postage rates, but the advantage seems minimal. There will also be a difference in sensitivity between upper and lower parts of the slot. No example has been see by the author.

1888 26 Sep. No. 13861. S.W.SUFFIELD See Fig 49.

An unequal-arm beam has a weight and fulcrum in fixed positions. A hanging letter plate can be moved along the graduated beam.

As with the previous patent, this instrument has the unusual principle of moving the load to achieve equilibrium. The patentee suggests its use for "letters or for sampling corn and the like". The drawing shows only the top half of the scale. No example has been seen by the author. Compare this with another design by the same patentee, on page 568.

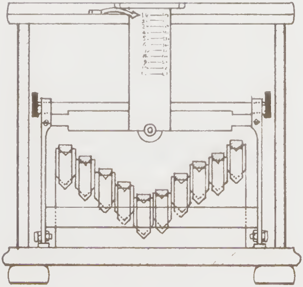


FIG 46. Watkins & Fidler's weight-lifting roberval. A frame hanging from the twin beams (Black rectangles) collects the bullet-shaped weights.

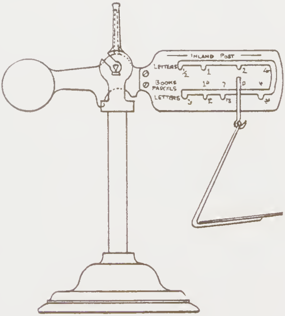
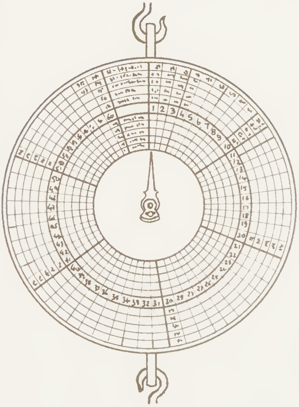


FIG 47. Smith's unequal-arm balance with U-shaped slot. The letter plate hanger is moved to the relevant notch.



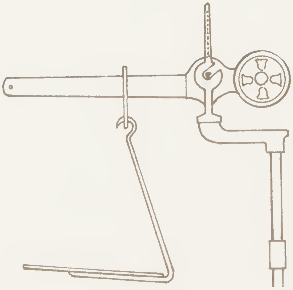


FIG 48. Left: Blacklock & Hynes' circular spring balance with multiple graduations.

FIG 49. Above: Suffield's unequal-arm balance. The letter plate hanger is moved along the beam.

1888 8 Nov. No. 16192. C.S.SNELL See Fig 50.

Various ideas are proposed for adapting a pen or pencil to serve as a letter weigher. The pencil holder has a suspension loop and a letter clip. A screw in the end serves as an adjustable weight for calibration of the instrument.

Another variation of the well-used theme combining a scale with a writing instrument. Apparently, the pen is removed before weighing, thus eliminating a source of error caused by changing the nib or inserting the nib to a greater or lesser extent. Alternative designs suggested by the patentee had a movable suspension loop either in holes or a groove; a series of suspension loops; a letter clip movable in a similar way; or a telescopic pencil holder graduated like a steelyard. No examples have been seen by the author.

1889 30 Mar. No. 5491. L.H.PEARCE & C.JACKSON See Figs 51 & 52.

A spring letter balance is incorporated in the case of a pen, pencil or penknife. The spring is either in compression or tension, as desired by the maker. The letter clip retracts into the case and is thereby protected. Slots in the end of the case provide access to the clip.

Yet another combined scale and writing instrument. The nib holder is stored with the nib inside the case. When required for use, it is pulled out, reversed, and pushed back into the holder. When required to weigh, the advantage of this design is that the instrument is simply pushed on to the edge of the letter which goes up the slots and automatically engages in the clip. Consequently, it is quicker and easier to use than other types.

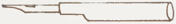


FIG 50. Snell's combined pen/balance.

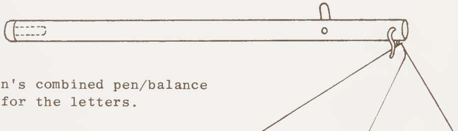
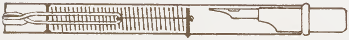


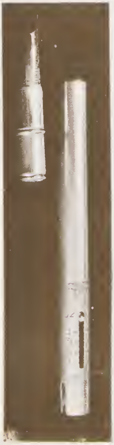
FIG 51. Pearce & Jackson's combined pen/balance
with auto clip for the letters.



1889 13 Jul. No. 11255. S.W.SUFFIELD See Fig 53.

A bismar letter scale has a beam which can slide through slots at the top of a pillar. The outer slot has a knife-edge pivot, the other slot is a guard to prevent excessive movement of the beam. A weight is suspended from one end of the beam and a letter plate from the other end. The beam is graduated in ounces.

This design was manufactured by Samuel Turner. Senior, whose trade mark STS was stamped on the beam. The drawing in the abridgement shows only the top half of the scale, but the complete instrument can be seen in Fig 53. Compare this design with another, by the same patentee, on page 566.



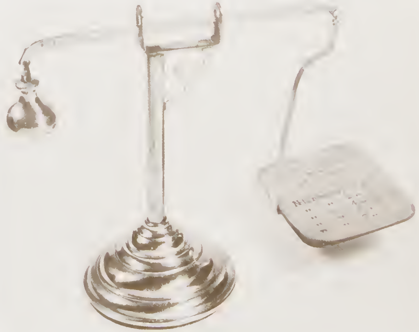


FIG 52. Left: Penholder and spring balance by Pearce & Jackson, marked POSTAL PEN. Nickel-plated brass.

FIG 53. Above: Suffield's postal bismar with postage rates for the period 1871 - 1897. All brass.

ISASC

EQUILIBRIUM®

QUARTERLY MAGAZINE OF THE INTERNATIONAL SOCIETY OF ANTIQUE SCALE COLLECTORS

1983–ISSUE NO. 3

PAGES 569-596

Cover Picture

AKAN SCALES, WEIGHTS AND ACCESSORIES

These brass objects were made by the Ashanti, Baule, and other tribes in the Akan region of Ghana and the Ivory Coast of Africa. They were for weighing gold dust used by the Akan people instead of coins. The scale beam (at rear) has ring-and-hole pivots and a simple cord suspension instead of shears. It has no pointer, and the paper-thin pans are chemically blackened. The box, used to contain the dust, has a crocodile motif on the lid (bottom left). Dust was scooped out using the spoon, which is shown approximately full-size (centre front). All the other objects are weights - three geometric shapes at the front; a little snake; seed-pods cast into a heavy weight; and three little men. The man on the left carries a long-barrelled gun, an animal on his back and various pouches. The central man has a box on his head and is smoking a pipe. The man on the right has a load over his shoulder and, perhaps, a stomach ache?

Comprehensive information about Akan weights can be found in the book reviewed on page 594.

SHOWCASE

Your help is needed for Showcase. Please send me one or two photographs of a scale or weights in your collection - ordinary, unusual or rare - it does not matter which. Write giving details of size, materials, maker's marks etc. and the purpose, if known. EDITOR.

INTERNATIONAL SOCIETY OF ANTIQUE SCALE COLLECTORS

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Early History of the Inclination Balance

Part 1

HANS R.JENEMANN

The inclination balance is one of the most successful devices in the history of scales, and is classified in the great group of lever balances. It is known by various names, including pendulum balance, quadrant scale, angle scale, bent-lever balance or pointer scale. Even today, when the use of the 'electronic balance' (based on weight compensation determined by electro-magnetic forces) is growing more and more, the use of the inclination balance is as widely used as ever - for example in the commonly used letter scale, Fig 1.

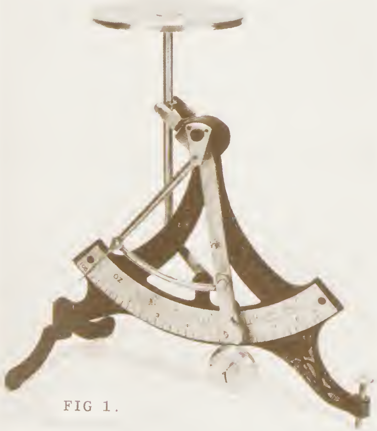


FIG 1.

The most noticeable component of the inclination balance is the swinging graduated arc, on which the result of weighing is indicated by a pointer when it comes to rest, Fig 2. Alternatively, the result of weighing may be determined by the 'deflection method'[+], as on very sensitive balances of the equal-arm type, such as the classical un-damped model of the precision or analytical type. On this type of balance a long pointer sweeps across a fixed arc. In principle, it is the same, whether the arc is fixed and the pointer moves, or if the arc is a moving component of the scale, and the pointer is fixed.

The equalisation of the inclination balance is achieved by raising a mass attached to the other lever arm, until the torques* are compensated, or balanced. Thus, the beam of the inclination balance rotates through an angle, the value of which is a measure of the acting force of weight. From this angle, the mass is determined (Ref.1). This is contrary to the 'balance with separate weights', which uses the torque of the weights to equalise the torque of the load placed on the pan of the other lever arm.

** Torque = rotating force.*

+See page 589.

According to the theory of the balance, it is a requirement of the equal-armed weighing instrument that the three knife edges are, as far as possible, in the same plane. The centre of gravity must lie a little below the fulcrum. (If it lies above, the balance does not function). If a small weight is placed in one of the pans, this side will sink, and the balance will come to rest in an inclined position due to the stabilizing moment* of the centre of gravity (this is a standard test for sensitivity, used by scale makers). So, in this respect, every 'classical' balance with three knives, may be described as an inclination balance !

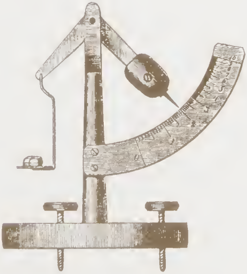


FIG 2. Inclination balance of F.Place, 1867.

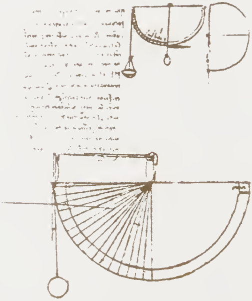


FIG 3. Inclination balance of Leonardo da Vinci. *(Courtesy Verlag E. Vollmer, Wiesbaden).*

However, in the proper inclination balance, it is generally an element of the construction that the knives, and the point of application of the weight to the beam, are not in the same plane. The beam end knives are located below the fulcrum by a greater or lesser distance. The greater the deviation of this angle from 180°, the more stable the system will become and the more insensitive the balance will be.

INVENTION OF THE INCLINATION BALANCE

If one tries to determine, from literature, the invention or the first application of the inclination balance, the claims are conflicting. In central Europe, most sources name Philipp Matthäus Hahn, the Swabian engineer-priest, as the inventor. In 1763, he is said to have constructed a "convenient household scale" (Ref.2) based on the inclination principle, when he was a relief priest in Ostdorf and assisted his father in nearby Onstmettingen (Swabian Alb.). Soon afterwards he, himself, became the clergyman in Onstmettingen.

In western Europe, England and France, there are other people to whom the invention is attributed. Thus, we hear of W.Ludlam of England, who published, in 1765, an account of "a balance of new construction", for use in the manufacture of woollens, (Ref.3).

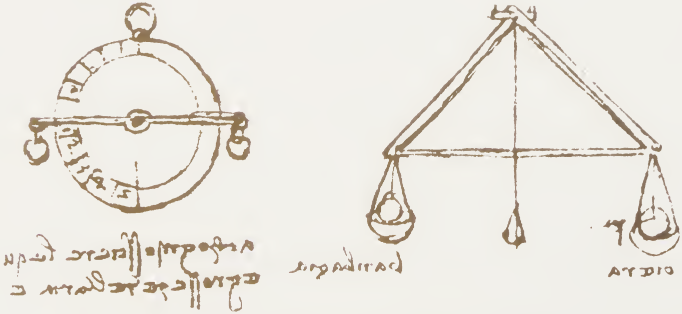
---

* *Moment = force x distance*

After the mid 18th century, there are to be found other publications about this subject. K.E.Haeberle (Ref.4) supposes that the invention of the inclination balance was generally "in the air". He not only cites the patent issued to J.S.Clais in England in 1772, but also refers to a publication of J.H.Magalhaens, in 1773, and calls attention to the hydrostatic balance of G.F.Brander, from Augsburg, in 1771, which is based upon the same principle. Bruno Kisch also referred to Brander's hydrostatic scales, (Ref.5)

Recently, it has been shown that there were earlier works in which the theory, function and construction of the inclination balance had been discussed, (Ref.6). Priority must be granted to other scientists; H.Kühn 1747, J.H.Lambert 1758, who had published reports about this type of instrument, and, possibly, to Mr.Rouse of England, who was mentioned by Ludlam, in 1765, as having made an inclination balance "many years ago" (Ref.20).

However, in the history of inventions, it is usually difficult to associate unequivocal rights to a single person. Nearly always, it is possible to discover predecessors after successful innovations, although previously, their ideas had gone unrecognised. The documents were buried in archives and were discovered much later - if they were not lost for ever- because contemporary circumstances were not favourable for the recognition of their genius. Such inventors lived in advance of their time. One of these genii was Leonardo da Vinci, who anticipated in his drawings, several inventions which did not become practical realisations until two or three centuries after his death.



FIGS 4 & 5. Weight hygrometers of Leonardo da Vinci, using the principle of inclination balances.
(Courtesy of Verlag E.Vollmer, Wiesbaden).

In other cases, innovations developed step by step and no individual was responsible for the complete concept. Also, there are ideas in which the principle is clear, but it has been applied to some other purpose. In the following paragraphs I will try to present the development of the inclination principle through the course of its early history.

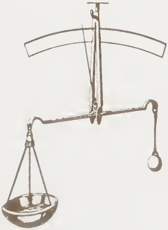


FIG 6. Equal-arm weight hygrometer of W.Gould, 1683. Inclination type.

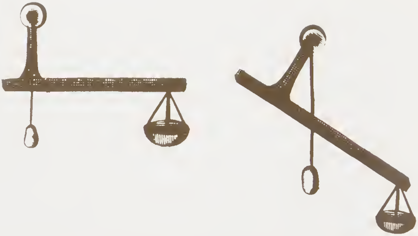


FIG 7. Weight hygrometer of Mr.Renes of England. Inclination type. (According to Monconys, 1665).

LEONARDO'S SELF-INDICATING BALANCES

The technical outlines of Leonardo da Vinci (1454 - 1519) contain sketches of self-indicating balances, as shown in Fig 3, (Ref.7). Leonardo also designed various hygrometers based on the same principle. One of them consists of a little rod which swings around a pin in the centre of a disc. The rod carries at one end, a little sponge which absorbs moisture from the atmosphere; at the other end is a wax counterweight. Another hygrometer is illustrated in Fig 4, "an instrument for indicating when weather will change". The horizontal part of the pivotted triangle is graduated, so when the little pan with the sponge sinks down, with the weight of water absorbed from the atmosphere, the plumb-line indicates the degree of humidity.

As with other designs of this universal genius, it is not known whether they were ever made into practical instruments. Today, it is difficult to determine whether Leonardo's ideas served , after his death, as a pattern for others. The technical manuscripts of Leonardo were dispersed, when he died, among different towns in Italy, where they remained, unrecognised, for nearly three centuries. They were first studied systematically by scientists towards the end of the 18th century, (Ref.8).

It may be significant that Leon B.Alberti (1404 - 1472) studied hygrometers before Leonardo, and he used an apparatus which was like one of Leonardo's, (Ref.9).

Later on, in the second half of the 17th century, there were reports from England about the use of instruments similar in principle. It may be supposed that such works had been done under the influence of Robert Boyle (1627 - 1691). B.de Monconys gave a description of the hygrometer of Renes, which included an illustration, Fig 7.(Ref.10). W.Gould also gave a detailed report about hygrometers of his own construction (Ref.11). One of them is formed as an equal-arm balance with an upward projecting pointer Fig 6. The other one appears asymmetrical; and the extension of the carrier indicates the measurement on the rounded scale, Fig 8. All these instruments operate on the inclination principle.

INCLINATION BALANCES AND SIMILAR INSTRUMENTS IN LEUPOLD'S THEATRUM STATICUM

In 1726, Jacob Leopold (1674 - 1727) published his 'Theatrum Staticum Universale' (Ref.12), consisting of the following four parts:

PART 1: 'Theatrum Staticum' - with all kinds of balances for weighing.

PART 2: 'Theatrum Hydrostaticum' - with all kinds of balances for weighing in water.

PART 3: 'Theatrum Aerostaticum' - withh all kinds of barometers, manometers, thermometers, hygrometers, and so on.

PART 4: 'Theatrum Horizontostaticum' - with all kinds of spirit levels.

Leupold describes all of the weighing and other instruments which were known at that time. His work is the most beautiful book which has ever appeared about scales and balances. It contained all the prototypes of the inclination balance which had been constructed at that time. In table XVII of Part III, are to be found several different hygrometers, even those of Monconys, of Gould, and of other designers. Table IX shows the manometer of Otto von Guericke (1602 - 1686), who is well known for the two "Hemispheres of Magdeburg". His instrument resembles the hygrometers mentioned before, and is based, likewise, on the principle of the inclination balance.

In Part II of his book, Leupold reproduces a drawing of the hydrostatic balance made by Johann A.Cass, of Kassel (Table VII). This balance is exhibited, today, in the Hessiches Landesmuseum in Kassel. The construction of the beam is asymmetrical, and readings for specific gravity are indicated, on the graduated quadrant, by a pointer extending from the end of the beam, Fig 10. The scale is mounted in a splendid baroque case, but, unfortunately, it has no weighing function today. According to H.Michel and P.A.Kirchvogel, this instrument was made by Cass, in 1720, (Ref.13).

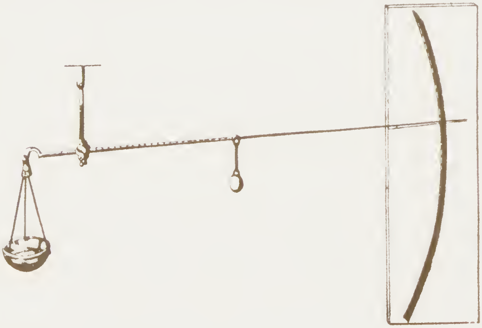


FIG 8. Unequal-arm weight hygrometer of W.Gould, 1683. with increased sensitivity.

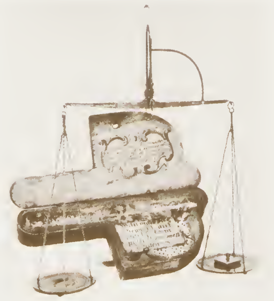


FIG 9. Nuremberg ducat scale with added quadrant. (EQM p 541). ***(Courtesy P.Riedinger).***

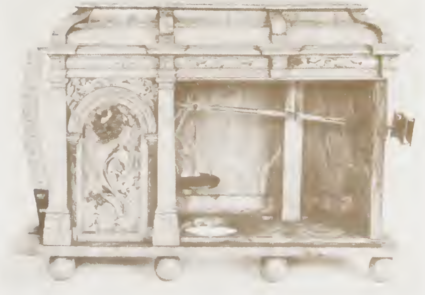


FIG 10. Hydrostatic balance of J.A.Cass, Kassel, c1720, in a splendid baroque case. Quadrant on the left. *(Courtesy Astronom.-Physikal Kabinett in Kassel).*

In addition to a great many balances, nearly all of which are variations of the lever type, Leupold gives, in Part I, a description of coin scales. Apart from the very ordinary money scales, there exists also, an "extra special species of money scale". Although it has equal-arms, when it is unloaded it is not in equilibrium. One of the pans is made heavier by the exact weight of a Hungarian ducat. If a ducat of full weight is placed in the other pan, the beam will balance level, but if the coin is under weight, the difference will be indicated by a quadrant attached between the pointer and the beam. Marks on the quadrant register against the suspension shears. In other words, it is a form of inclination balance. Leupold illustrates, in Table VIII, such a coin balance, but with a quadrant on both sides of the beam. Usually, these 'Waglein ohne Gewicht' (Little scale without weights) were asymmetrical, as shown in Fig 9, the Nuremberg ducat scale.

In Part I of his Theatrum, Leupold was also dealing with the theory of the balance - as far as it was possible at that time. He was worried by the beam with arms which formed an angle to each other, Fig 12, but he was not yet able to explain the principle of the pendulum balance by the trigonometrical ratio of the inclination angle.

s'GRAVESANDE'S PRECISION HYDROSTATIC BALANCE

At almost the same time as Leupold wrote his treatise on balances, the first complete textooks on physics were published by two famous Dutchmen, Willem J.s'Gravesande (1688 - 1742) and Pieter van Musschenbroek (1692 - 1761). In his very detailed textbook (Ref.14) s'Gravesande also describes hydrostatics, and, for these experiments he needed a precise balance which would turn with a fiftieth part of a grain, or less, when the load in each pan was three or four ounces, (i.e. a sensitivity of 0.1 mg with a total load of about 100g).

But s'Gravesande could not find such a sensitive balance, and tiny weights

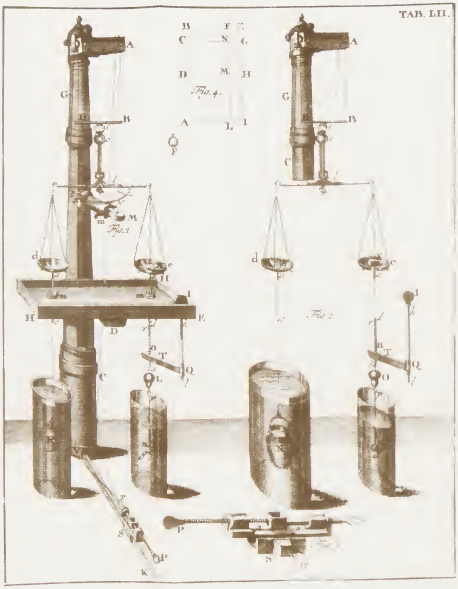


FIG 11. Hydrostatic precision balance of W.J. 'sGravesande, 1742. The load was mostly balanced by weights in the pan. Small amounts were indicated on the graduated rod below.

of high precision were also unobtainable. So, he had made an equal-arm balance of special construction, Fig 11. All the details of its construction were described, even the new manner of arrestment and the apparatus to determine the fine sub-divisions of weight:- Below the right pan 'H' a rod 'r-s' was fixed, which was calibrated upwards and downwards from point 'a'. When carrying out hydrostatic experiments, the beam would sink or rise. The loss of weight was equalised by weights added to the pan, - but not completely, if very small amounts were needed. The beam was allowed to stay in an inclined position, and this inclination was measured by the indicator 'T' at the new height of the graduated rod.

This design, by s'Gravesande, seems to be the earliest combination of the equal-armed two-pan precision balance with the inclination principle - even without a graduated quadrant at the end of the pointer, or at the end of a tapered beam. In this way, he achieved a resolution a little better than $1 : 10^5$ when weighing 100g. (i.e. 0.1mg).

Combining the principle of the equal-arm balance with that of the inclination balance soon became common practice. Fig 13 shows a copperplate engraving of 1765 (Ref.24), depicting an English chemical-technical laboratory. One of the two analytical balances, which are housed in cases, has a downward facing pointer and a graduated arc.

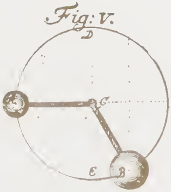


FIG 12. "A crooked Beam" for a balance of J.Leupold, 1726.

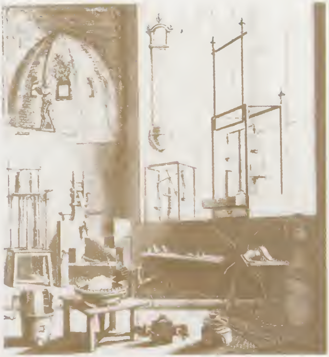


FIG 13. (Right) Laboratory balance with a pointer and inclination quadrant shown in an English laboratory, 1765.

Part 2 of Inclination Balances will appear in a future issue of EQM.

* * *

CONVENTION '83

Egyptian & Roman Scales

Egyptian scales and Roman steelyards look straight-forward, but Otto Spiegler has some unusual theories about their use. Illustrations of Egyptian scales show a central device suspended from the scale which seems to be used for accurate indication of equilibrium, Fig 1. What was this device ? The original drawings are frustrating in their lack of detail, and no ancient balances have been found with the device still intact. So, Mr.Spiegler has put forward an interesting theory that the device was a plumb-weight suspended by three cords. When the beam was level, the cords were all tight, but if the beam tilted, one of the cords went slack, indicating the slightest imbalance. It is a nice theory, but practical experiments show that it does not work, and that it could not give the sensitivity to make weights of the accuracy of those weights which have been found.

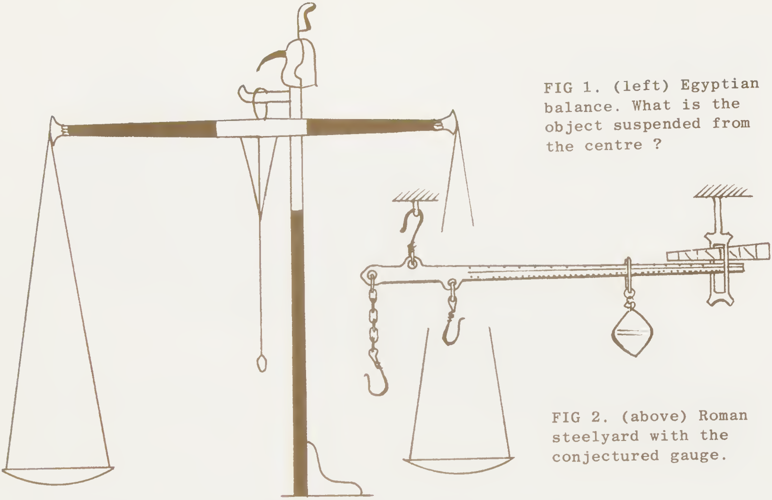


FIG 1. (left) Egyptian balance. What is the object suspended from the centre ?

FIG 2. (above) Roman steelyard with the conjectured gauge.

Utz Schmidt presented Spiegler's theory, then he demonstrated, with a beautiful replica of an Egyptian beam, that the tight cords are insensitive. The ISASC audience were invited to comment and during the ensuing lively discussion, several alternative theories were proposed.

Another theory by Otto Spiegler concerns the accurate weighing with Roman steelyards. He suggests that the space between notches on the steelard blade are too coarse for accurate weighing. Some Roman illustrations show steelyards with a 'nose-guard' - a frame around the end of the blade to prevent excessive tilting. Mr.Spiegler suggests that another Roman artifact, a tapered graduated bronze stick, was used as a gauge to determine the tilting of the steelyard blade within the nose-guard, so measuring small increments of weight between the notches, Fig 2.

Again, practical demonstrations, using modern steelyards, seem to disprove the theory. If a constant additional weight is added, at different settings on the blade, the degree of tilt is not constant. It varies with the setting. Puzzled by this anomaly, Utz Schmidt consulted experts in the weighing industry and found that, mathematically, it is possible for the gauge to work.

The illustrated paper, presented to all members attending the Convention, sets down these theories in detail, and shows the mathematics of steelyard design. Any member wishing to have a copy of the paper should write to Utz Schmidt.

Utz is continuing his investigation into these theories, and would welcome any comments from other members. It is hoped to publish the results of this project, and any alternative theories, in a future issue of EQM.

Letters

In my article 'Collecting Letter and Parcel Scales' (Antique Finder, Dec. 1977.)* I cited three changes that the Uniform Postal Act of 1840 brought about. Subsequent research has brought to light additional information which suggests that the changes (actually four) effected by the Act, can be stated more accurately and fully, as follows:

1. Postage could be prepaid by the sender.(a)
2. Postage could be affixed in the form of a postage stamp.
3. The amount of postage was determined by letter weight, rather than by the number of sheets.(b)
4. The amount of postage no longer increased according to distance.

A fifth change, while not mandated by the Act, was the use of envelopes, which only took place when the economies afforded by changes 3 and 4, above, went into effect.

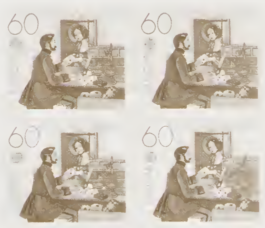
(a) In point of fact, postage could be prepaid in the General Post for many years prior to 1840 (in London as early as 1680, elsewhere after 1800). However, prepayment did not become common until the passing of the Uniform Postal Act and the soon-to-follow advent of the postage stamp. Moreover, still today (believe it or not), letters can be sent unpaid within the United Kingdom, requiring the addressee to pay double postage.

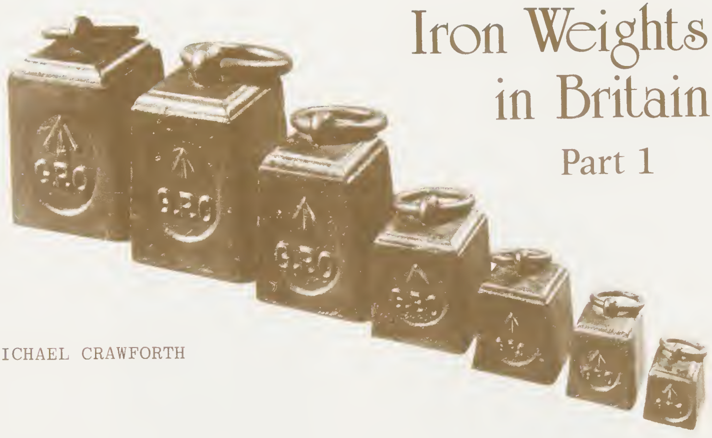
(b) It appears that as early as 1812, postage for letters of more than three sheets was charged according to ounce weight, but no evidence exists to support any theory that prior to 1840 very many letters were so voluminous as to require this type of charge. One indication that weight, prior to the Act's passing, was hardly ever a factor in determining postage charges is that postal scales did not come into being until 1839 - 40.

BOB STEIN

* *Reprint available from ISASC Publications - Editor.*

As a result of seeing the Swiss postage stamps on page 562, Herbert Grieshaber sent in these German stamps. They depict a post office in 1854. On the bench is an equal-arm balance suspended from a pillar. Both pans are on cranked hangers. In front is a pile of flat-round weights and a set of small weights in a wood block.





Iron Weights in Britain

Part 1

MICHAEL CRAWFORTH

The origin of iron weights is lost in antiquity, but iron became a popular material for weights during the last few centuries. Going back to 1590, it seems that very few were used in London. In that year, a report was prepared for the Founder's Livery Company (trade guild) and it stated:- *"...Leaden Waits ar and have been used time out of mynd by all shoppmen and sellers of smalle wares except such as retail fine wares as Sewing Silk, Gold lace and such lyke, who have ever used the Brazen Waits..."* Although, according to this report, lead weights were used predominantly in 1590, iron weights were being used only a few years later, because, in 1599, the Founder's Company issued instructions regarding iron weights.

During the 1600's, the use of iron weights was increasing, and in 1622, the Plumber's Livery Company decided that they should receive revenue for the use of lead in sealing iron weights: *"It is thought fit and ordered that there shall be from henceforth paid unto the use of this Company for sealing of iron weights, 6d for every hundred."* It is not clear from this statement whether "every hundred" referred, literally, to each hundred weights sealed, or whether it referred to each hundredweight of weights, as the term 'hundred' was often used for hundredweight.

FIG 1. (Above) Iron ring weights used by the Post Office and marked GPO below a government 'broad arrow'. Denominations 8,7,4,2,1,½,¼ LB. The rectangular lead plugs underneath have verification stamps of the 1950's (except the 8 lb which is not stamped). The 8 lb weight is an unusual denomination, and was not permitted for trade use by the regulations of 1878. However, the GPO was not using the weights for 'trade', i.e. the selling of goods, so they could use the weight even though it was not allowed to be stamped.

As the use of iron weights increased, the use of lead weights declined, and, as Maurice Stevenson states (Ref.1), *"The more durable iron and brass or bronze weights appear to have won the battle for supremacy by the end of the 17th century."* The reasons for this change in popularity were probably two-fold; growing concern with the effects of wear on the accuracy of lead weights in commercial use; and the cost of the material from which weights were made. Some light is thrown on this subject by an inventory of a London scalemaker's stock-in-trade, of 1726. There, the valuation of new iron weights was , on average, equal to 1d per pound, which compares very favourably with the valuation of lead weights at 2¼d per pound and brass weights at 11d per pound.This relative cost is reflected in the stock listed: iron weights totalling 386 lb, lead 183 lb, and brass 48 lb. Later, in 1777, George Sewell, another London scalemaker, sold some scales and weights to Mr.Owen. The bill of sale shows prices equivalent to 2d per pound for iron weights and 1s 4d per pound for brass. Clearly, iron had advantages for ordinary trade use - lower cost than lead or brass, and greater durability, providing the iron was protected from rust.

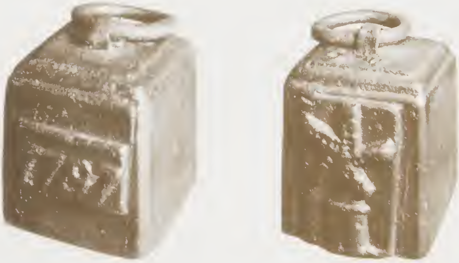


FIG 2. An 18th century iron weight with the date 1797 on one side and a picture of a five-sailed windmill on the other. Decoration of this kind is extremely rare, but square iron ring weights continued to be made until the 20th century.

It can be assumed that other 18th century scalemakers were also making iron weights, as well as lead, brass or bronze. Unfortunately, the vast majority of scalemaker's trade labels did not mention the material used, although they all include weights among the products advertised. However, the label of Ioseph Sommers states, in c1750, "Selleth all sorts of Weights of Brass, Lead & Iron." Substantial use of iron weights in the 18th century may be deduced from the Carysfort Report of 1758, in which the Keeper of the Guildhall, who was also the Sealer of Weights and Measures for the

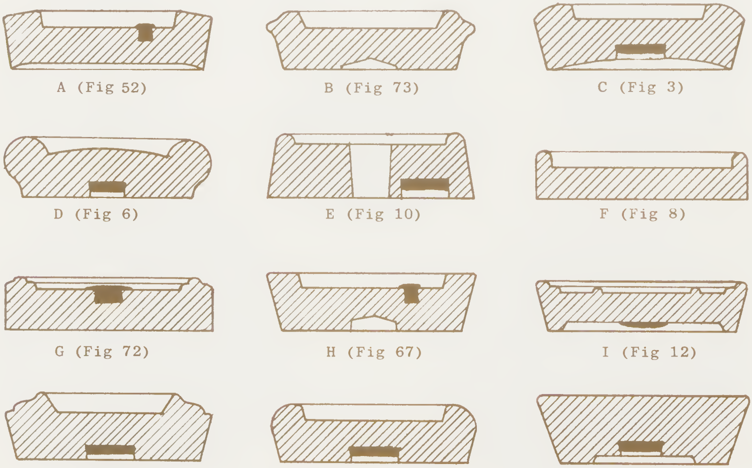
City of London, described his duties. For verification of weights he charged *"...One Farthing for every Brass and every Lead Weight; 20d per ton for Iron half-hundred Weights and above; one Farthing each for smaller iron Weights,..."* This separate reference to weights of 56 lb and over, suggests that, as one would expect, the cheapness of iron made it a popular material for large weights.

Although it is common to refer to the weights as iron, they were actually cast iron, which is an impure, brittle form of iron containing 2 - 4.5 % of carbon and other impurities. The hardness of this material was an advantage in resisting wear, but it also made the marking of the denomination or maker's marks more difficult than bronze, brass or lead. Cast iron was too hard to stamp or engrave satisfactorily, so the weights were either left plain, or they had the marks cast integrally on the surface. Some black-painted domestic iron weights had the denomination marked elegantly, in gold paint, but this was not substantial enough for trade weights.

The design of iron weights used in the 18th century, and before, seems to have been confined to a few shapes, as Maurice Stevenson observes (Ref.1) regarding iron weights of the 16th and 17th centuries, *"What evidence there is from the period, suggests ring weights of cylindrical or square section."* Illustrations of weights from the 18th century, show flat-circular, bell and ring weights, of unspecified material. This conservatism changed as events developed in the following century. ▷

Parts 2 and 3 of this article will be in future issues of Equilibrium.

DRAWING 1.



A (Fig 52) B (Fig 73) C (Fig 3)

D (Fig 6) E (Fig 10) F (Fig 8)

G (Fig 72) H (Fig 67) I (Fig 12)

J (Fig 13) K (Fig 5) L (Fig 69)

NOTES ON THE ILLUSTRATIONS

FIG 3. "WILLIAM CROSS 1 lb ONE POUND" lead plug underneath has the stamp crown ER 152 (Edward VII 1901-1910) and subsequent year stamps 27 and 39. The maker's name (without his Son) indicates a date before 1885. Cross-section C in Drawing 1.

FIG 4 "BUSHELL YORK 1 lb" lead plug underneath stamped crown GR 302 and the year 33 (George V 1910-1936). Bushell was, and is, an ironmonger and agricultural engineering firm in York.

FIG 5 "SIDDONS W.B. 1 lb" lead plug underneath stamped crown GR 302 and the years 30, 31. W.B. is for West Bromwich. Cross-section K, Drg.1.

FIG 6 " SWAIN 1 lb IMPERIAL" lead plug underneath stamped crown G5R 14B and the year 18. The use of 5 instead of V is uncommon. 14B is the district. Cross-section D, Drawing 1.

FIG 7. "IMPERIAL 2 OZ" lead plug underneath, unstamped. Patterned border.

FIG 8. "2 OZ" there is no adjustment plug, so the weight was probably made for domestic use Cross-section F, Drawing 1.

FIG 9. "2 OZ" there are three lightening holes underneath. A copper plug on top is stamped DURHAM around a crown - the mark used before 1878. Iron weights below 4oz were made illegal for trade use by the regulations of 1890. Only one hole was permitted by the same regulations.

FIG 10. "½ lb = 7 lb" rectangular lead plug underneath, stamp obliterated. The hole through the centre of the weight fitted on a spike, as for example, on a 'bob-up' coal scale. It is a proportional weight weighing ½ lb, but measuring a load of 7 lb. This shows that the scale had a lever ratio of 1:14. Cross-section E, Drawing 1.

FIG 11. "TH & S 8 OZ" lead plug underneath stamped crown ER 33 (Edward VII). Initials of the maker T.Holcroft & Son.

FIG 12. "IMPERIAL STANDARD 8" (8oz) lead adjustment underneath, stamp obliterated. Cross-section I, Drawing 1. It became compulsory to put the full denomination on weights in 1878.

FIG 13. "HOLCROFT WOLVERHAMPTON 2 LB" lead plug underneath stamped crown VR 65 (Queen Victoria 1836-1901). Cross-section J, Drawing 1.

FIG 14. "A.K.& SONS 4 OZ" also 8 OZ and 1 LB. The denomination is repeated on the rim as part of the decorative border. Lead plugs underneath stamped crown VR 33. Initials of Archibald Kenrick & Sons.

FIG 15. "IMP^{l} STN^{d} 2 1826" (2 lb) square lead plug underneath stamped with the castle of Northumberland, used until 1878. The inclusion of the date is not common.

FIG 16. "IMPERIAL STANDARD 3½ lb 1826" lead plug underneath. 1826 was the date of new Weights and Measures legislation. It was not necessarily the date of manufacture of the weight. A denomination of 3½ lb was not legal for trade after 1878.

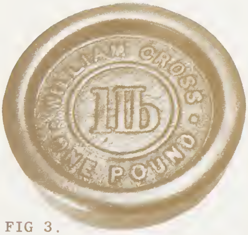


FIG 3.

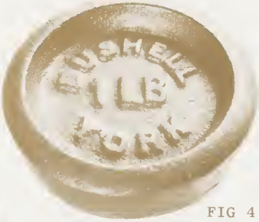


FIG 4.

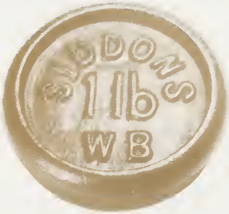


FIG 5.

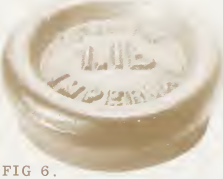


FIG 6.

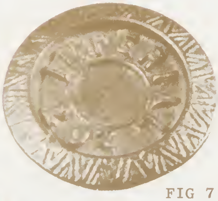


FIG 7.

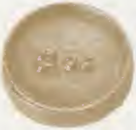


FIG 8.

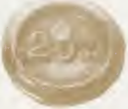


FIG 9.

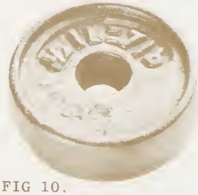


FIG 10.

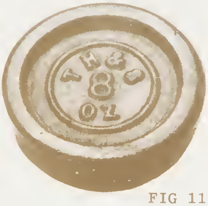


FIG 11.

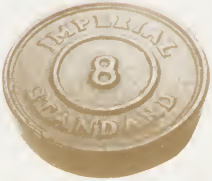


FIG 12.

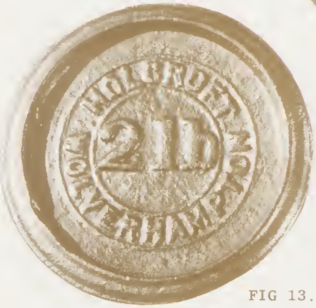


FIG 13.

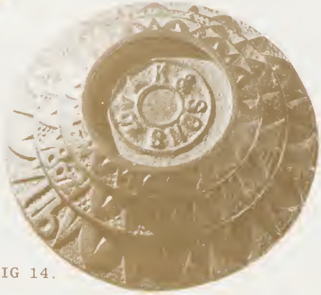


FIG 14.

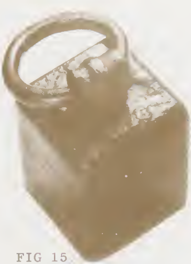


FIG 15.

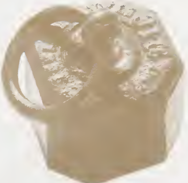


FIG 16.

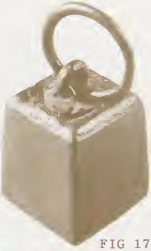


FIG 17.

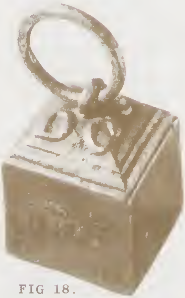


FIG 18.

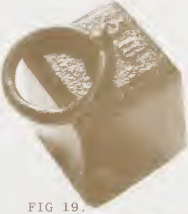


FIG 19.

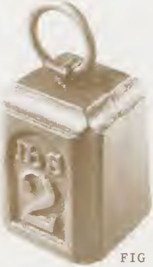


FIG 20.

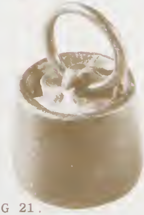


FIG 21.

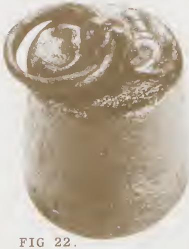


FIG 22.

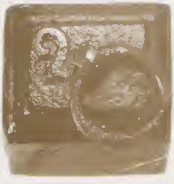


FIG 23.

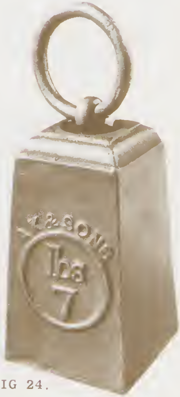


FIG 24.

FIG 17. Marked, simply, "1" (1 lb). lead adjustment on the top around the ring. Rectangular plug underneath, stamp obliterated - all signs of manufacture before 1878.

FIG 18. "D.C. 3 Imp^{1}." (3 lb) large round lead plug underneath, stamp obliterated. The initials DC have not been identified.

FIG 19. "5 lb" lead plug underneath.

FIG 20. "2 lbs" square lead plug underneath, stamp obliterated.

FIG 21. No marks. weight 1 lb. lead adjustment around the ring on top.

FIG 22. "3½" (3½ lb) square lead plug underneath, stamp obliterated. Odd denominations were made illegal for trade use from 1878.

FIG 23. Marked, simply, "2" (2 lb) rectangular lead plug underneath, stamp obliterated. The high angle of view shows the unusual rectangular form of this weight.

FIG 24. "A.K.& SONS Lbs 7" the large round lead plug underneath is stamped crown VR 33. The deep recess on top, around the ring, appears to be for lead adjustment. The initials are those of Archibald Kenrick & Sons.

FIG 25. "CANNON 1K" round lead plug underneath, stamp unreadable.

FIG 26. "= 1 cwt" "= 56 lb" lead plugs underneath, no stamps visible. These are proportional weights which weigh 1 lb and 8 oz, respectively, indicating that the scale had a lever ratio of 112;1

FIG 27. "1 kg AVERY" rectangular lead plug underneath, stamped crown over 303 and the year 36. The omission of the monarch's initials is very unusual.

FIG 28. Left: "4 LM" round plug underneath, stamp unreadable. The initials LM are unidentified. Centre: "2 LB" lead plug on top, stamp unreadable, and a quadrilobe lead plug underneath, not stamped. Right: "1 LB" large square lead plug underneath, stamp obliterated.

FIG 29. "1 Kg" on top, and "ENGLAND" underneath. Lead plug underneath, not stamped.

FIG 30. "200 GRM AVERY" round lead plug underneath stamped crown GR 229 and the year 21 (1921).

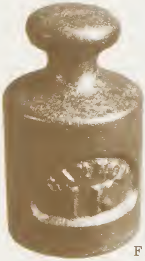


FIG 25.

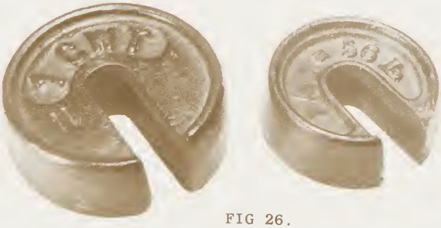
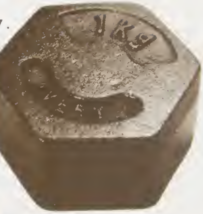


FIG 26.

FIG 27.



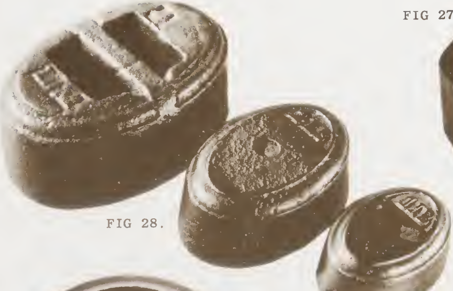


FIG 28.

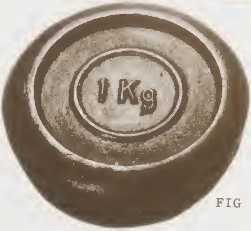
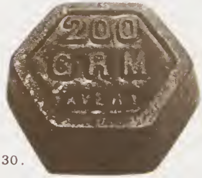


FIG 29.

FIG 30.



Parts 2 & 3 of the Iron Weights article will appear in a future issue of EQM.

* * *

SCALE CARNAGE

To a collector, the dutiful destruction of thousands of scales and weights by Weights & Measures departments, must be abhorrent in the extreme, but it was an official policy in most countries. Scale suppliers poured scorn on old-fashioned scales in use, and persuaded their owners to buy the latest technology - and then sold the old scales to scrap merchants, having first broken the old scales irreparably, preventing second-hand use. Inspectors and scales men now say, "If only ...."

The scenes of destruction by the Los Angeles Department of W.& M. (In Contemporary Comment, EQM p555) was reprinted by courtesy of Jon Hellman and 'Red' Meade.

Precision Balance

HANS JENEMANN

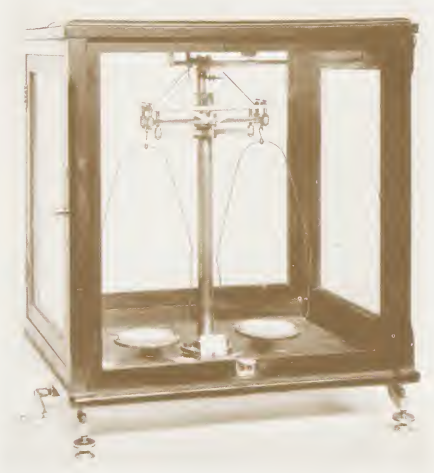


FIG 1. Paul Bunge's short beam analytical balance, c 1870.

This is the short beam analytical balance in its initial and elementary form.* It was constructed by Paul Bunge (1839 - 1888) in Hamburg, c1870. The beam was made in a special manner, being screwed together from individual metal rods, instead of being cut from a single large piece of brass. Arrestment of the beam is operated by the crank on the left side of the case. The beam length is 130mm (5.1") and the case is 350 x 250 x 380mm high (13.8 x 9.9 x 15.0").

Each pan can carry a maximum load of 200g, but the smallest weights placed on the pan are 10mg. Amounts from 10mg down to 0.1mg are measured by the position of the rider-weight along the rider-bar. The rider-weight is manipulated by the rod and hook from outside the case. The graduations on the rider-bar are not symmetrical about the centre of the beam. The zero is at the left end and 10mg at the right end, Fig 2, so, when the balance is being set to zero before weighing, the rider weight must be at the left end.

When weighing with a balance of this type, it is not necessary to wait until the beam comes to rest. Readings of the pointer are made by the 'deflection method'. The readings are taken at the maximum swing of the pointer on the left and on the right, then the arithmetic mean is calculated. For greater accuracy, five readings are taken, as indicated schematically in Fig 3.

** Compare with long beam balance shown in Precision Balance 2, EQM p563.*

Using the deflection method, the analytical balance has the additional function of an inclination balance. In this case, it is necessary to know how many divisions correspond to one milligram on the little chart at the bottom of the column. The user must determine this sensitivity.

Bunge founded his workshop in Hamburg in 1866, and he was the first to make analytical balances in this new manner. He gave the reasons and mathematical arguments for his design in scientific journals of the time. One important advantage was that his short beam balances had a considerably reduced oscillation time compared with long beam balances.

Before Bunge, there was a 'forerunner' in the manufacture of short beam balances. Thomas Charles Robinson (1792 - 1841) of London, made 140mm beams (5.5") c 1830, which would weigh a maximum of 400 grains (26g) in each pan with a sensitivity of 0.001 grains (0.067mg).

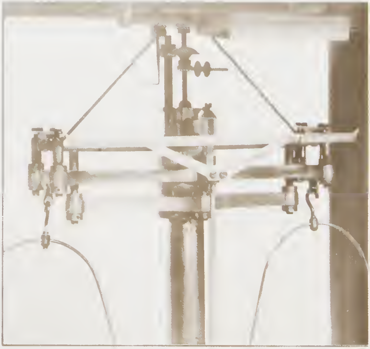


FIG 2. the thin rider weight is on the hook just above the rider bar.

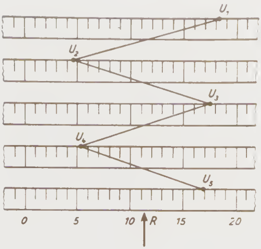


FIG 3. Five successive readings are taken as the pointer swings to its maximum on left and right. Averages are calculated to determine the mean position 'R'.

4.6 18.2

17.5

5.3 16.9

$\frac{9.9}{2} = 4.95$ $\frac{52.6}{3} = 17.53$

4.95
17.53

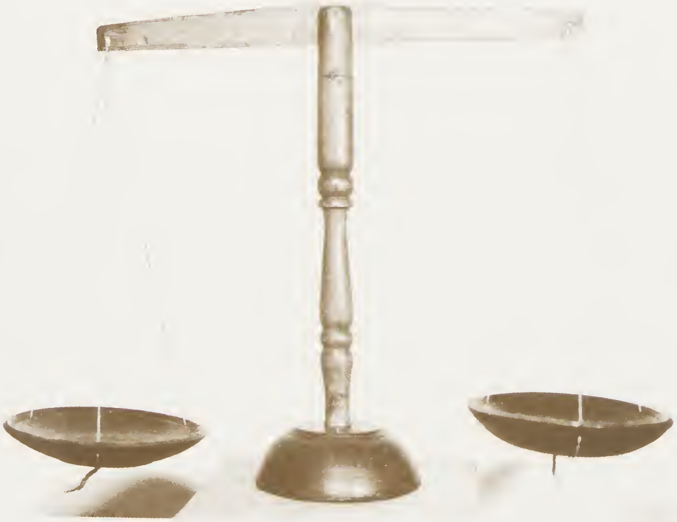
$\frac{22.48}{2} = 11.2$

R = 11.2

NQ 68 BUTTER SCALE

query from A.Pommier.

I am enclosing a photograph of a wooden balance which was bought in Canada, in 1981. It was said to have been made in England and taken to Canada around 1880. Have you any information about this type of balance? Is it a real scale, or just a decorative object?



REPLY

from the Editor.

I have seen several of these balances in England, mostly in museums. They are usually called "butter scales" and are said to have been used in dairies in the 18th and 19th centuries. A similar scale was illustrated in Veteran Scales and Balances by B.Jewell, Fig 62, page 43.

The elementary construction from wood is typical and,usually, it is the decorative style of the centre pillar which varies. Presumably, they served a need in farms and large country houses, where the standards of accuracy required for trade did not apply. I have never seen weights associated with these scales.

NQ 69 VANDOME, TITFORD & CO. query from A.Middleton.

Do you remember seeing in my shop a very pleasing gold-weighing scale with a folding base, which was inscribed 'R.Vandome, Titford & Co' ? It fitted into a mahogany case with a label signed R.Vandome & Coy, 117 Leadenhall Street, London. The label includes a list of weights for the following coins; guinea, half and quarter, seven shillings piece, 5-sovereign, double sovereign, sovereign and half, crown, half-crown, shilling and sixpence. Please could you give me a brief summary of the probable dates of the scale and its weights?

REPLY from the Editor

The Vandome company has been in existence for many years, and they claim to have been established in 1660. Richard Vandome was apprenticed to the scale maker James Moffett, in 1773. He became a freeman in 1781 and shortly after this date succeeded to the business of Samuel Freeman 3rd. By 1806, he was already in business at 117 Leadenhall St., the address on the label of your banker's scale.

Subsequently, there were several changes of partnership, Titford & Vandome; Vandome, Titfords & Pawson; Vandome, Titford & Co, until in 1930, the firm became Vandome & Hart Ltd.

In addition to the scales made for institutions, the various Vandome companies made high quality pocket coin scales, diamond balances, paper scales, grain scales and all kinds of scales and weighing machines and weights for trade purposes.

Vandome, Titford & Co were in business concurrently with R.Vandome & Co, at the same address, which may account for the use of both names on the banker's scales.

The table of coin weights listed on the label includes the 5 sovereign, which was first issued in 1839, while the address of the company changed from 117 to 56 Leadenhall St. in 1863. The Royal coat-of-arms shown on the label was that used from 1801 to 1837.

It would appear, from the above, that the date of manufacture of the scales was 1839, or very shortly afterwards.

NQ 70 POURIN query from J.Katz.

I got a new scale recently, by the French maker Pourin. It is precisely the same as No.288 described by Sheppard & Musham, on page 147. Can you add any further information ? ▷

According to Lavagne*, Pourin worked during the period 1798 to 1816, and was the successor to Pillois. Before 1803, Pourin gave his address as 'rue Denis entre la rue Troussevache et celle des Lombards'. After 1803, it became 'rue Saint-Denis, vis-à-vis celle des Lombards, au coin de la petite place Gastine No.73'.

** Lavagne F.G. 'Balanciers, Etalonneurs - Leurs Marques, Leurs Poinçons' Published Montpellier, France 1981.*

Review

BALANCES & WEIGHTS

Publishing a catalogue of balances and weights in the Whipple Museum of the History of Science is an excellent idea, which other museums would do well to emulate. The catalogue briefly describes 104 scales and 14 weights, from Britain and Western Europe, and includes inscriptions; main mechanical features; dimensions; materials, and details of weights where these are of dating significance. Some descriptions also include supplementary comments which add interest and understanding. The catalogue includes some historically important chemical balances; rare and attractive coin scales; diamond scales; apothecary scales; steelyards and Nuremberg nesting weights, spanning the 17th to 20th centuries. There are illustrations of some of the outstanding items, but they are too small to show much detail.

When a publication of this kind comes from an academic institution, it is unfortunate to find it includes a few outdated and inaccurate points. Small Chinese do'tchins were used for weighing a form of money and should not be described as "Opium Scales" (EQM p 55-57). Burmese mythical bird weights are called Hentha weights, not "Duck Weights" (EQM p 345-352). "Jeweller's Scales" are usually for weighing gold and silver (Avery Catalogues), and the little pocket balances illustrated and described in the Museum catalogue are 'diamond scales' (or, in continental Europe, 'carat scales'). A letter balance with weight positions marked P,2P,4P,8P etc, refers to 'Postages' used from 1840 to 1871 (EQM p 353), and should not be dated 1925. John Harris was working in the period 1690 to 1710, not c1775 as shown in the catalogue. But, these faults represent a small part of the catalogue, and should not detract from its undoubted utility.

The Whipple Museum is to be congratulated on its initiative in producing a most useful and interesting catalogue, which is good value for money. The catalogue is recommended to researchers, and to collectors interested in detailed comparisons with scales and weights in their own collections.

'Balances & Weights' - Catalogue No.2. by Olivia Brown. Available from the Whipple Museum of the History of Science, Free School Lane, Cambridge, England. Attractive dark green cover, typewritten and electrostatically (?) copied, written in English, size A4, 32 pages, 36 illustrations. Price £1.20, including postage by surface mail to all countries. By airmail to USA £1.70; Australia and Japan £2.00.

EQUAL MEASURE FOR KINGS AND COMMONERS - GOLD WEIGHTS OF THE AKAN

Akan territory includes the Ashanti, the Baule, and several lesser tribes of West Africa, who all made very similar weights.

In this attractive and profusely illustrated book, Andre Nitecki briefly discusses the purpose, design, manufacture, symbolism and use of goldweights in a way which is most interesting for collectors. He draws on research by T.F.Garrard and B.Menzel, which, added to his own, provides an outline of the mass standards of the Akan tribes, and their derivation from Islam and European systems. But, the table of 85 mass groups, derived from weighing thousands of goldweights in museums, presents a frustrating study. The table progresses with a continuous range of values with apparently arbitrary divisions, which seems to have no statistical basis (to the uninitiated ?). As any handful of pebbles would fit into the table, the reader might be justified in concluding that these Akan objects are not weights, after all! I would have liked an explanation.

What a pity that the author did not include a study of the scales used with these weights (there is only one illustration, and only one passing reference). Their design, with a fulcrum well above the end pivots, makes them very insensitive by European or Islam standards. Surely, this must have had an effect on the accuracy with which the weights were made and used. It may well explain the wide scatter in measured mass values of the weights.

Although there is still much work to be done on this subject, Andre Nitecki brings together a brief and highly readable account of Akan goldweights. Unlike some authors, he has spent many years living and working in West Africa, and has first-hand knowledge of the people. The consequent air of authority and broad outlook on the subject, is a refreshing change from the treatment of goldweights as mere art objects.

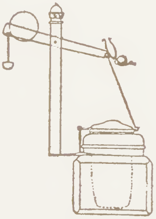
This book is a useful addition for all collectors with an interest in weights - but do not expect to find definitive dates, identification or tribal origins for examples in your collection.

'Equal Measure for Kings and Commoners - Goldweights of the Akan' by Andre Nitecki. Glenbow Museum, Calgary, Canada. 69 pages. 213 illustrations. Attractive glossy booklet. Available from ISASC Publications.

Patent Postals

MICHAEL CRAWFORTH

A SURVEY OF POSTAL SCALES PATENTED IN BRITAIN, 1840 TO 1940.



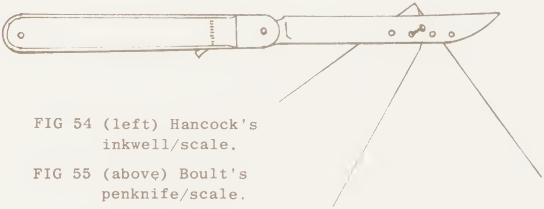


FIG 54 (left) Hancock's inkwell/scale.

FIG 55 (above) Boult's penknife/scale.

1889 1 Aug. No. 12202. A.HANCOCK — See Fig 54.

The lid of an inkwell is attached to a counterweighted arm so that, normally, the lid is held open. It is closed by the weight of a pen placed in a pen-rest on the end of the arm. The arm also serves as a letter balance. The letter is placed in a clip next to the pen rest, and balanced by moving the counterweight. Additional weights can be added to a hanger behind the counterweight.

This is another ingenious Victorian combination of a scale with other functions. It takes no account of the variation in the centre of gravity of different sized letters. No example has been seen by the author.

1890 9 Apr. No. 5411. A.J.BOULT — See Fig 55.

A pocket knife is adapted for weighing letters by providing a knife-edge pivot on the handle, and a series of holes in the blade. The letter is suspended from the blade by passing a pin through the letter and into one of the holes in the blade. Two retractable pivot pins may be used instead of the knife edge.

When used for weighing, the pivot would be placed on the edge of a table or shelf. The simplicity of this design has merit, but the accuracy.....? No example has been seen by the author.

1890 30 Oct. No. 7589. G.LUNDBERG — See Fig 56.

A roberval and steelyard scale has the main weight movable in 1 lb steps. A frame suspended from the end of the twin beams collects weights, as required, to counterbalance the load, and indicates the ounces on a graduated arc.

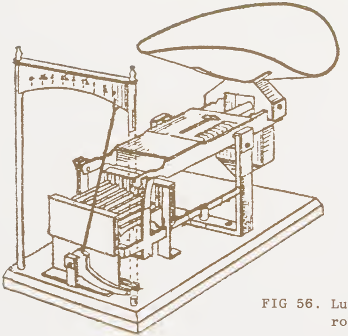


FIG 56. Lundberg's combined roberval, steelyard and weight-lifter.

This interesting variation of the weight-collecting beam extends the capacity for weighing parcels and other objects. The accuracy is restricted to the steps provided by the collected weights, as is the case with all collecting beams. No example has been seen by the author.

1893 7 Apr. No. 7201. G.CHAPPELL See Fig 57.

A pen or pencil of the telescopic type is adapted for weighing letters. A spring clip contained within the cap is released by turning the cap until two slots coincide. A letter is placed in the clip and the instrument is balanced on the edge of a table, or is suspended by the wire loop. The barrel of the pencil is extended or retracted to achieve equilibrium. Postage rates are marked on the barrel.

Another combined scale and writing instrument which seems practical, apart from the usual variation in weight caused by the length of lead remaining after use. No example has been seen by the author.

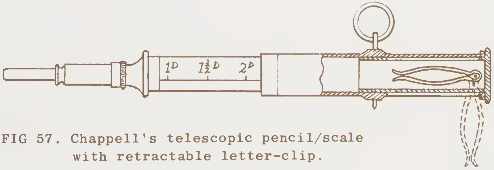


FIG 57. Chappell's telescopic pencil/scale with retractable letter-clip.

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QUARTERLY MAGAZINE OF THE INTERNATIONAL SOCIETY OF ANTIQUE SCALE COLLECTORS

1983–ISSUE NO. 4

PAGES 597-624

Cover Picture

This fascinating pendulum balance was used to weigh gold coins circulating in England during the 18th century. It is marked Anscheutz & Co. No.1524, showing that the firm had already made a considerable quantity. The company was run by Valentine Anscheutz and John Schlaff in Denmark Street, Soho, listed in London trade directories between 1761 and 1781.

The gold coin in doubt - a Johannis, a moidore, a guinea, or one of their subdivisions - was placed in the pan, which swung the whole quadrant round to the left until the scale balanced. The pointer, which did not move, was then pointing to the value of the gold marked on the quadrant. The graduations were marked at intervals of 6 pence, from the smallest coin, a 4s 6d to a 36s (s = shilling, d = penny). As the guinea and half-guinea were the most common coins, extra graduations were marked at 2d intervals to more accurately indicate the reduction in value of worn coins.

The scale folds back into the flat mahogany box, which is only 12mm thick, (1/2"). The polished brass pillar and pan contrast nicely with the silver-plated quadrant and the royal blue paper lining in the box. When in use, the lid can be partly closed against the back of the pillar, to prevent the scale falling back.

This is one of several designs for pendulum balances in a patent issued to John Sebastian Clais, of London, in 1772. (The patent drawing erroneously shows the pointer at the end of the graduations, instead of the beginning. See Fig 24 on page 607).

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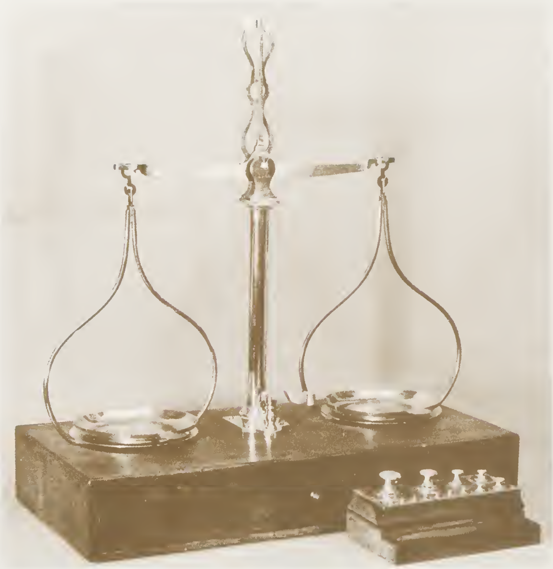


FIG 1.

An Apothecary Balance

AIMÉ POMMIER

It is not very long ago that most pharmacies had, in pride of place, a balance of the type illustrated. Before the eyes of their customers, they weighed medicines taken from magnificent bottles.....

The illustration shows the balance with its box of knobbed brass weights. The set probably came from a small pharmacy which has long since disappeared from the centre of Paris.

Overall height of the balance is 590mm (23.3"). The wooden base, which includes a drawer, measures 272 x 548 x 93mm (10.7"x 21.5"x 3.6")

Inside the brass column is a steel slide of rectangular section, which has a brass forked block on top of it, to support the balance. The bottom of the slide rests on the foot of a lever inserted in the base of the column. By depressing the lever, the balance is raised from a position of rest to the weighing position.

The beam, with its very tall pointer and 'double-hole' beam ends, is made from a single piece of steel. The main fulcrum comprises two half-knives, which rest on steel bearings inserted in the forked block. The length of the beam, between knives, is 330mm (13"), and 365mm (13.3") overall.

On each of the beam end knives hangs a hook, suspending an elegant brass stirrup hanger. At the bottom of the hanger is a slightly convex disc of 152mm (6") diameter, to support the pan. The brass pans, of 147mm (5.8") diameter, are fitted with small handles.

An elegantly pierced bracket, which is fixed to the back of the forked block, holds a small graduated arc to show the displacement of the pointer.

The balance is sensitive and very finely adjusted. With no load, pointer displacement is perceptible with the addition of 0.05g. The total travel of the slide and forked block is 14mm (0.6"), but, when returning to the rest position, the pans settle on the base only a fraction of a millimetre before the forked block comes to rest on the column. Thanks to this perfect adjustment, the fulcrum knives are relieved without being deflected from their normal place. The capacity of the balance appears to be 2000g.

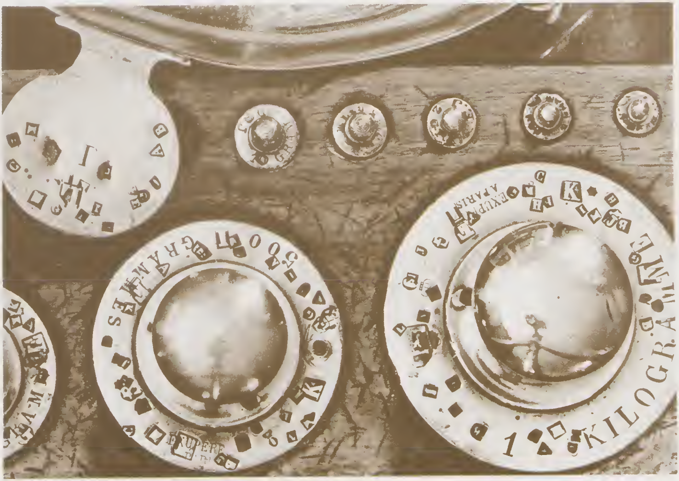


FIG 2. Weights & pan handle.

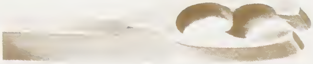


FIG 3. Double-hole beam end.

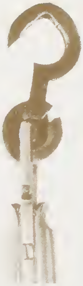


FIG 4. Hook for the hanger.

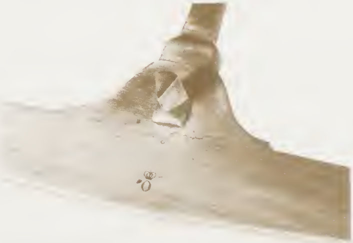
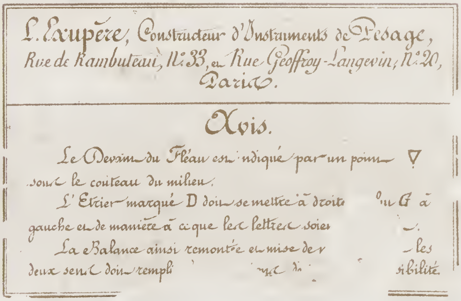


FIG 5. Mastersign on the beam.



L. Exupère, Constructeur d'Instruments de Pesage,
Rue de Rambuteau, N.° 33, et Rue Geoffroy-Langevin, N.° 20,
Paris.

Avis.

Le Devant du Fléau est indiqué par un point ∇ sous le couteau du milieu.

L'Etrier marqué D doit se mettre à droite [illegible] ou G à gauche et de manière à ce que les lettres soient [illegible].

La Balance ainsi remontée et mise de [illegible] les deux sens doit rempli [illegible] sibilité.

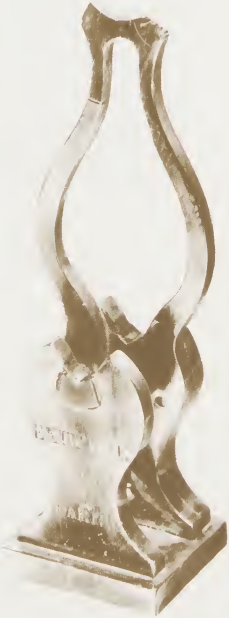
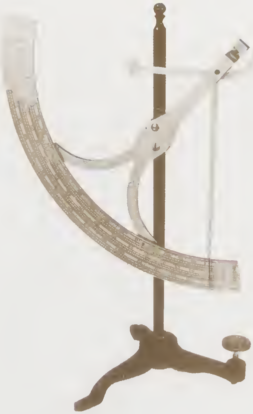


FIG 6. Forked block.

Inside the base are glued three labels, affixed since the inspections were carried out by Exupere. The dates of these inspections are 1901, 1913 and 1935. It appears reasonable to suppose that the balance was put into service about 1890, and that it was used until about 1950.

The box contains weights of the following denominations: 1,2,2,5,10,10,20, 50,100,100,200,500 and 1000g. The weights from 50 to 1000g, and the forked block, are marked EXUPERE A PARIS, and the smaller weights are marked DJ, EJ or AB. The largest weight, and the centre of the beam, are stamped with Exupere's mastersign, a crowned 'O'. All the weights have a large number of stamps - at least 50 on the 1000g weight. Each pan also has a score of stamps, impressed on the handles.



Early History of the Inclination Balance

Part 2

HANS R.JENEMANN

FIG 14. Paper scale made by Louis Schopper of Leipzig, c1900. Sold by F.Leunig & Co. of London.

EULER'S PRECISE THEORY

L.Euler (1707 - 1783), the great mathematician and physicist, a native of Basel, was the first to state the 'theory of the balance' in precise mathematical terms. For many years, he was a member of the Imperial Scientific Academy of St.Petersburg. In his dissertation 'De Bilancibus' (Ref.15) of 1738 (published in 1747), Euler explains the static fundamentals of the lever balance and develops the dynamics of the swinging beam with three axes. From this, he defines the essential qualities of the balance. At the same time, he deduces that the angle of deflection is a function of a small mass added to one of the pans; the tangent of this angle is related directly to the active force of weight. With his discourse, Euler not only defines the theory of the equal-armed balance with three axes, which was known at that time in practice, he also gives, by implication, the basic theory of the inclination balance.

KUHN'S NEW AND MORE PERFECT BALANCE

H.Kuhn (1690 - 1769), professor of mathematics, was a founder-member of the Philosophical Society of Danzig, which had been established in 1742. In the same year that Euler's work was published, 1747, Kuhn published a comprehensive dissertation about "A new and more Perfect species of Balance" (Ref.16).It was a subject he had lectured on, to society members, some years earlier. Using trigonometric laws, Kuhn attained, more or less, the same results as Euler, in particular, the fundamental theory of the lever balance when the beam is inclined - it is possible that there was some communication between the Societies of St.Petersburg and Danzig, those towns being relatively close.

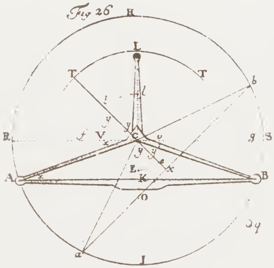


FIG 15. (above) Deduction of the trigonometric laws for an inclined beam with high fulcrum, by H.Kuhn 1742.

FIG 16. (right) Johann Heinrich Lambert (1728-1777).

But, the work of Kuhn goes, in essence, beyond Euler's reflections. He contemplates a balance on which he intentionally alters the height of the fulcrum in relation to the beam end knives, Fig 15. He arrived at conclusions which had not been previously established. As a consequence, he had made a balance with the fulcrum higher than the beam end knives. If the two pans are differentially loaded, the beam assumes an inclined position. The inclination is read on a graduated circle, and is used to calculate the proportion of the forces on the two sides of the balance. If one of these quantities is known, the mass of the other can be determined with the highest accuracy.

LAMBERT'S COLLABORATION WITH BRANDER

In 1758, J.H.Lambert (1728 - 1777), Fig 16, of Mulhausen (Ref.17), presented a new theory of the balance (Ref.18). As a consequence of his reflections, he decribes a new species of scales. His models have no second pan and have no movable counterpoise, Figs 17,18,20, and they have no other features of the symmetrical balance of tradition. Lambert's balance has two lever arms set at an angle to each other and between which is fixed a quadrant indicator. A single pan is suspended from one arm, and on the other arm there is a fixed counterpoise, instead of a weight pan.

The graduations are not uniformly spaced, but decrease as the angle of inclination increases with growing loads. A plumb-line is used as an indicator, and in part, the suspension of the instrument operates as a plummet.

A second design by Lambert has a fixed quadrant and an indicator combined with the scale beam, to indicate the weight.

Lambert's designs were suitable for making practical instruments without further development, and they were cheifly used in the hydrostatic form as "brine scales" for determination of the salt content in different liquids. Lambert was one of the most universal 18th century scientists and a natural philosopher. In addition to many other fundamental works, he established the laws of photometry, the measurement of light. After a restless nomadic life, he came, ay the age of fifty, to Augsburg for two years. Here, he consolidated his friendship with G.F.Brander, who had been permitted to make Lambert's inclination balances. Lambert was made a member of the Royal Academy of Sciences in Berlin, where he remained for the rest of his life.

Brander (1713 - 1783), was the most famous engineer and instrument maker in central Europe, at that time. Later, in 1771, he published a detailed description of his hydrostatic scales, Fig 19, which were manufactured in his workshop (Ref.19). In the foreword of his treatise, he confirms that he made such instruments according to the instructions of Lambert given more than 10 years earlier.

INCLINATION BALANCES IN WESTERN EUROPE

As mentioned previously, in England there were several examples of scientific instruments founded on the principle of the inclination balance. They may be considered as precursors of the proper inclination balance for weighing masses.

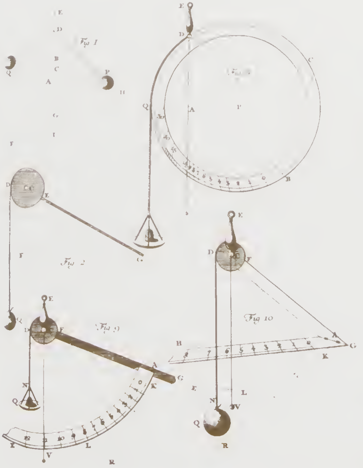
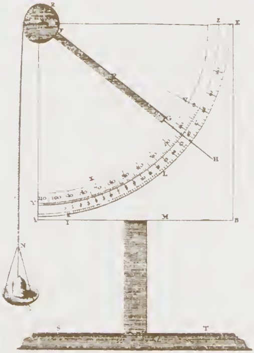


FIG 17. (left) Divisions on the inclination scale by J.H.Lambert, 1758.

FIG 18. (below) Inclination scale with fixed quadrant and moving pointer, by J.H.Lambert, 1758.



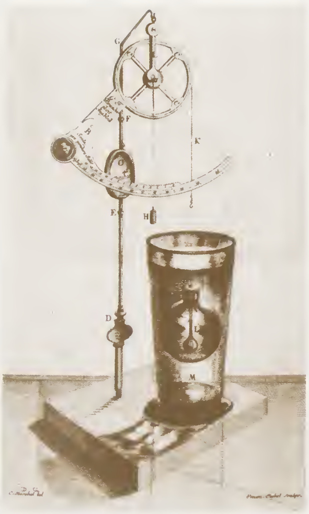


FIG 19. (above) Hydrostatic scale for brine, by G.F.Brander, 1771.

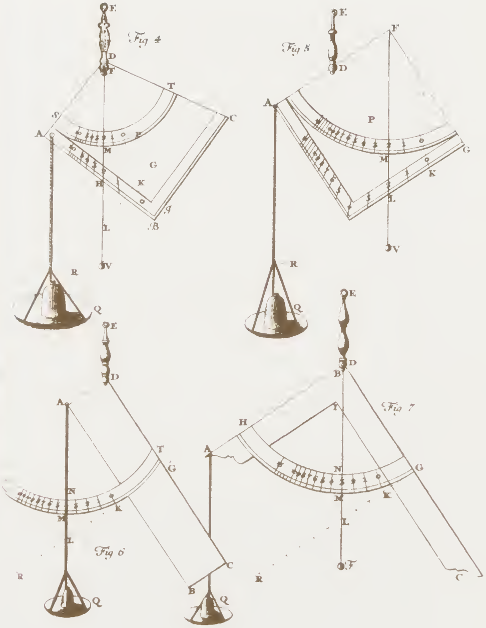


FIG 20. (right) Various quadrant scales by J.H.Lambert, 1758.

In 1765, W.Ludlam gave an "Account of a Balance of a new Construction" (Ref.20), which was made for the use of woollen manufacturers, Fig 21. The balance is symmetrical in form, but on one side there is a fixed counterbalance of one ounce, the other side accepts the load. Each of the lever arms is six inches long, and the angle formed between them is 168°. As the deviation from 180° is not very great, the sensitivity must have been relatively high. Thus the little balance could be used for weighing fairly small masses - as when a measured length of woollen yarn was suspended for the rapid determination of yarn weight. The result was read directly from the graduated circle at the position of the pointer.

Ludlam mentions, in his report, that "Mr.Rouse of Harborough, many years ago, made a machine for sorting woollen thread upon the same principle with this; but what he did was mostly tentative, he was not aware of some considerable advantages which the theory points out." There seems to be nothing known about the construction and date of Rouse's balance.

A few years later, in 1773, J.H.de Magalhaens (1722 - 1790) published the "Description of a New Balance" in a French scientific journal (Ref.21). The designer, a descendant of the Portuguese circumnavigator of the world (Magellan), was a member of the Royal Society, in London. The balance was made by a London scientific instrument maker, Fig 22. It was for weighing heavy loads and was installed in the palace of the Duke of Aremberg, in Brussels, where it proved to be superior to other scales, such as the steelyard.

Magalhaens' design included several technical innovations; for instance, it had features which reduced friction and thereby improved the precision of weighing. In order to use the balance universally, the quadrant was divided into five different weight systems - the units of Paris, Vienna, London, Hamburg and Brussels.

Magalhaens explicitly refers to the invention of this weighing technique by Ludlam, in 1765. He acknowledges his use of Ludlam's principle, but not the details of the execution, i.e. the design. He continues, that, at a later date, a German produced great numbers of Ludlam's balances with little alteration. In addition, this person permitted Magalhaens to use the English patent - but the name of the patentee was not mentioned.

Examination of English patents for that period shows Patent No.1014, of 1772 (Ref.22), issued to John Sebastian Clais, from the county of Middlesex, for various inclination balances. The Christian names "John (Johann ?) Sebastian", surely atypical for England, may intimate German origin and thus confirm Magalhaen's statement.

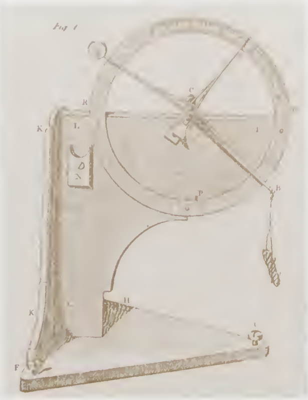


FIG 21. Balance for woollen manufacturers by W.Ludlam, 1765. The angle of the beam is only 22°.

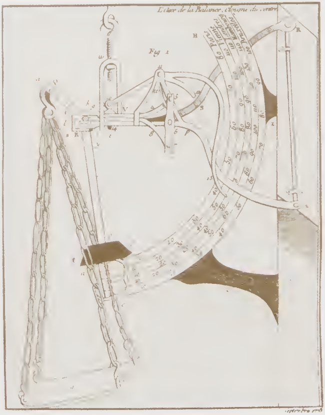


FIG 22. New balance of J.H. Magalhaens, 1773. It has graduations for five different weight systems.

In Clais' patent, several different designs are described and illustrated, Figs 23 & 24. However, if any similarities exist, they are much nearer to the models presented 15 years earlier, by Lambert, than to Ludlam's yarn balance. Figures 23 and 24 from Clais' patent, illustrate the amazing similarities (compare them with Figs 17,18,20). Thus, it may be maintained that even the other designs of inclination balance, of that period, had their origins in Lambert's ideas, and that he may be the real inventor of the instrument, not acknowledged, until the present time.

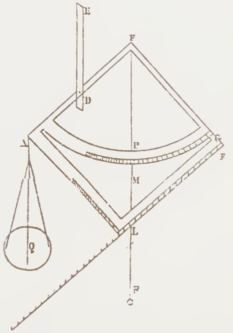


FIG 23. Index balance by J.S.Clais, 1772. Compare with Fig 15.

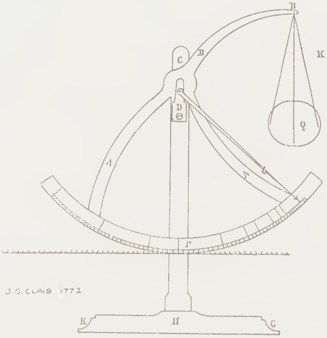


FIG 24. Index balance by J.S.Clais. See the coin balance made to this patent by Anscheutz & Schlaff. (Cover Picture) c1772.

Soon after Magalhaens' report, a note was published on the same subject, by Colonel de Brequin, presumably in Paris. He refers to Magalhaens' design, and shows detail modifications and an additional weight, Fig 26, thus extending the capacity to more than 25 pounds.

HAHN'S CONVENIENT HOUSEHOLD SCALE

A recently published paper deals with the balances devised by the Swabian engineer-priest, P.M.Hahn (1739 - 1790). It shows that the opinion that Hahn made the first inclination balance, in 1763, is not correct, (Ref.25). Hahn's involvement with balances started in 1769, when he was clergyman of the parish of Onstmettingen; soon after that, he moved to Kornwestheim, near Stuttgart.

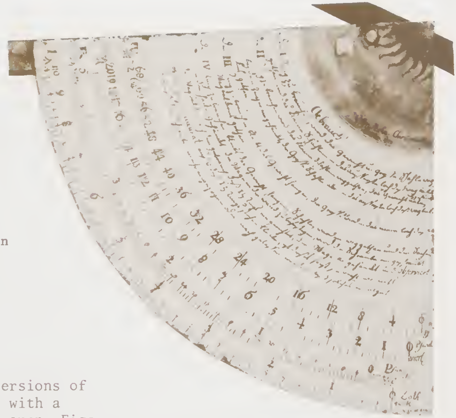
In his first years in Onstmettingen, Hahn began his mechanical activities with watch-making. He installed a workshop and manufactured astrolabes. But Hahn, himself, never claimed to have made the first inclination balance. This was postulated after Hahn's death, due to erroneous interpretation of his notes. However, whether it was 1763, or 1769, it is more than likely that Hahn already knew of the hydrostatic scales made by Brander in Augsburg - in his technical daybook, a little later, Hahn quotes a clear description of this instrument.

FIG 25. (Top right)

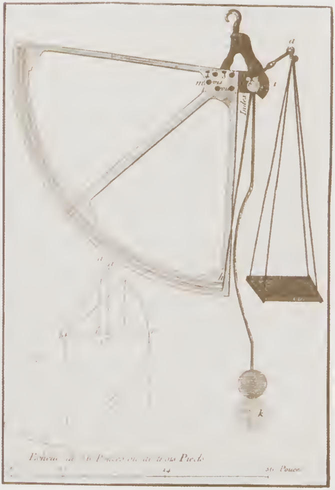
Inclination balance from the workshop of P.M.Hahn, 1770; closed scale of iron for four weighing ranges; with inscribed directions for use. *(Courtesy of the Wurttemb. Landesmuseum)*.

FIG 26. (Lower right)

Index balance of Colonel de Brequin, 1773; provision was made for two, or more, weighing ranges.

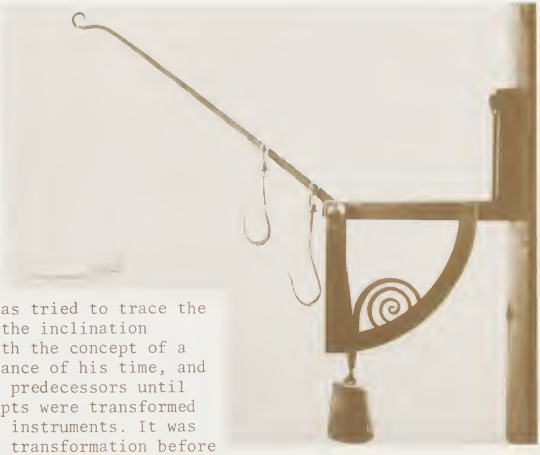


There were two different versions of Hahn's scales, one of them with a closed quadrant, the other open, Figs 25 & 27. First, Hahn made the closed quadrant type (1769) which could be used for different weighing ranges. The load arm had three suspension points for the pan. When it was suspended from the point furthest from the fulcrum, the balance had its highest sensitivity, but could be used only for light loads. For weighing heavier loads, the pan had to be suspended from one of the other two points, with less sensitivity. The iron quadrant was graduated for different weighing ranges corresponding to the three suspension points. Hahn also set down directions for the use of the balance. Later, perhaps after 1775, Hahn produced the open-arc scale working on the same principles.



Thus, credit is due to Philipp Matthaus Hahn for recognising a new application of a weighing principle already known in literature, but used for other purposes. It is more than possible that his "household scale" can be traced back to the ideas of Lambert - as can other designs of the inclination balance.

FIG 27. Inclination balance from the workshop of P.H. Hahn, (Kornwestheim c1780). Open scale for three weighing ranges. *(Courtesy Staatl. Math.-Phys. Salon, Dresden-Zwinger).*



CONCLUSION

This detailed study has tried to trace the early development of the inclination balance, beginning with the concept of a genius who was in advance of his time, and continuing with other predecessors until the theoretical concepts were transformed into the first useful instruments. It was a long time after the transformation before the inclination balance attained the importance which it has maintained until today. Again and again, new proposals were presented for producing balances according to a principle which does not have the highest accuracy, but which permits weighing to be done quickly.

In some countries, the inclination balance was widely used - including 'official' purposes - and displaced other systems. In other countries, this useful principle was, for a long time, restricted to the private sphere.

CORRECTIONS TO PART ONE OF THIS ARTICLE

Please note that the word 'swinging' should be omitted from sentence 1 in paragraph 2, on page 571.

On pages 576 and 577, the sensitivity of s'Gravesande's balance should be 'c 1.0 mg (not 0.1 mg). In his book, s'Gravesande gave the sensitivity as "a fiftieth part of a grain", i.e. 1.2954..mg.

(Apologies - Editor.).

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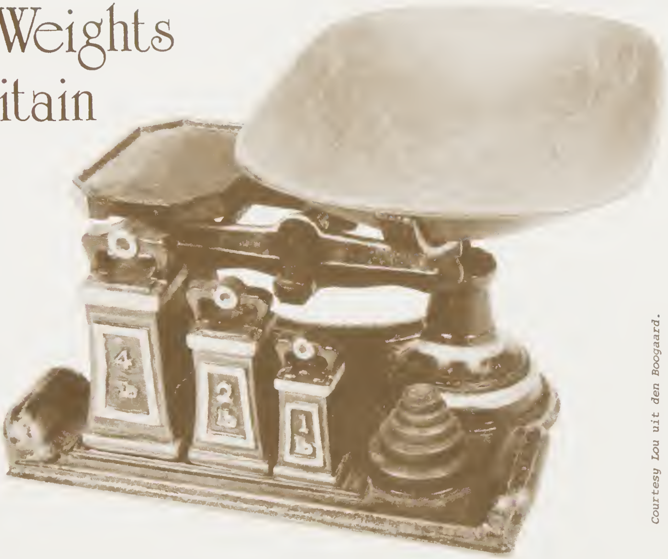
Iron Weights in Britain

Part 2

MICHAEL
CRAWFORTH



Courtesy Lou uit den Boogaard.

In the 19th century, the dominance of iron and brass/bronze over lead was assured when the 1834 Weights and Measures Act prohibited the use of soft metals; "...after the First Day of January 1835 ...no Weight made of Lead or Pewter shall be stamped or used." From the mid 19th century to the early 20th century, the use of iron weights became very common and many iron founders were in business making an extraordinary variety of shapes and sizes. In addition to the regular sizes familiar today, denominations of 1¾, 2½, 3½, 5, 6 and 10 lb were available, as the extract from Clark's catalogue of c1865 shows, Page 612.

Unusual denominations were usually made for special purposes in trade or industry, where repeated use made special weights a worthwhile convenience. For example, if 3¾ lb of dye was regularly used for dying batches of cloth, it would be much more convenient to use one special weight, rather than four standard weights 2,1,½,¼ lb. Bakers used a weight of 2 lb 1½ oz for the dough to make a 2 lb loaf. The extra 1½ oz was an allowance for the evaporation of moisture. In the scale industry, 5 lb and 10 lb weights were used for testing counter scales, because their capacity was often in multiples of 5 or 10 lb.

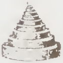
FIG 31. (above) Square-bell and round-flat iron weights shown with their 7 lb capacity scales by W.& T.Avery Ltd c 1900. The weights were black decorated with gold bands and thin red lines. Listed for trade and domestic use. Earlier versions had separate handles on the tray.

CLARKS' IMPROVED GENERAL IRON FOUNDERY GOODS. 109

WEIGHTS.

ROUND CAST FLAT WEIGHTS.

Fig. A 109.



¼ AND ½ OZ. ALL BRASS.

	Plug'd with Copper or Lead s	d	If Stamped. s	d	Not Plug'd s	d	
8 lb. to 2 oz	4	4	5	0	3	10	per set.
4 lb. to ¼ oz.	1	10	2	3	1	7	,,
2 lb. to ¼ oz.	1	2	1	6½	0	10	,,
1 lb. to ¼ oz.	0	9	1	1	0	6½	,,
¼ oz.	0	6			0	5	per doz.
½ oz.	0	6			0	5	,,
1 oz.	0	8			0	7	,,
2 oz.	0	10			0	7	,,
4 oz.	1	2			0	11	,,
8 oz.	1	9			1	6	,,
1 lb.	2	9			2	6	,,
1¾ lb.	4	3			4	0	,,
2 lb.	5	0			4	9	,,
3 lb.	7	0			6	6	,,
4 lb.	9	0			8	6	,,

Fig. B. 109.

Fig. C. 109.

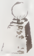
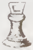


Fig. D. 109.



RING AND BELL WEIGHTS.

PLUG'D WITH LEAD OR COPPER.

	s	d			s	d	
¼ lb.	1	9	doz.	5 lb.	11	9	doz.
½ lb.	2	3	,,	6 lb.	12	9	,,
1 lb.	3	6	,,	7 lb.	1	2	each
1¾ lb	5	0	,,	10 lb	1	6	,,
2 lb.	5	6	,,	14 lb	2	0	,,
2½ lb.	6	0	,,	28 lb.	3	6	,,
3 lb.	7	6	,,	56 lb.	6	6	,,
3½ lb.	8	6	,,	60 lb.	7	0	,,
4 lb.	9	6	,,	112 lb.	12	9	,,

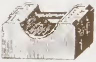
Square Ring Weights, with Gilt Figures.

¼ lb. and ½ lb. . . . . 2s. per dozen extra.
Larger . . . . 3s. ditto ditto

NEW PATTERN BAR WEIGHTS.

PLUG'D WITH COPPER OR LEAD.

Fig. E. 109.



	s	d			s	d	
¼ lb.	1	9	doz.	2½ lb.	6	0	doz.
½ lb.	2	3	,,	3 lb.	7	6	,,
1 lb.	3	6	,,	3½ lb.	8	6	,,
1¾ lb.	5	0	,,	4 lb.	9	0	,,
2 lb.	5	6	,,				

1/-	1/6	1/9	2/-	3/-	3/3	5/9	6/3 each
7lb	10lb	14lb	15lb	25lb	28lb	50lb	56lb

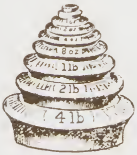
SPANISH WEIGHTS.

8 lb.	1	3	each.
16 lb.	2	3	,,
32 lb.	4	0	,,
60 lb.	7	6	,,

FOREIGN WEIGHTS MADE TO ORDER.

T. & C. Clark & Co. will, on orders for 100 sets and upwards, if required, cast the name of any Customers on the 4lb. weight.

T. & C. Clark & Co. have introduced an *improved pattern*, made with the weight engraved on rim in place of ornamental border.



ROUND ENGLISH WEIGHTS
OF REGISTERED PATTERN.

Extracts from catalogues of T.& C.Clark & Co. Above, from c1865. Right, from 1880.

These intermediate denominations were difficult to distinguish, visually, from the more common sizes of 1,2,4,7 and 14 lb, especially so, when many weights were not marked with their denomination, or were marked with small or indistinct figures. The possibility of confusion was thus considered conducive to fraud, so, in the important Weights and Measures Acts of 1878, 1889, 1897 and 1904, the Board of Trade was authorised to set down regulations governing the denomination, marking, stamping, design and protective coating of iron weights. The regulations arising from the Acts of 1889 and 1904 came into force in 1890 and 1907, respectively. It must be emphasised that these regulations applied to the use of weights for trade. There was no restriction on weights used for other purposes. Those regulations of interest to collectors and researchers are shown below.

The regulations are not as useful for dating purposes as it might, at first, appear. For example, the prohibition of lead around the top of ring weights, and the requirement for correction plugs to be underneath, does not mean that all weights before the regulations had the lead on top. Many examples from earlier times had lead underneath - the weight dated 1797, Fig 2, is only one of many. Similarly, some weights, from before the regulations, had the denomination marked clearly on top, or on the side. So, as with the dating of most weights (or scales), it is necessary to take ALL the evidence into consideration.

The great variety of shape of iron weights made before these regulations is one of the main attractions for collectors. There seem to be more different designs in iron than in any other material. The reason is open to speculation; perhaps it was because there were more iron founders who felt they could 'have a go' at casting weights, and being outside the traditions of the scalemaking industry, they used their imagination to design shapes different from their competitor's. This great flowering of creative design was characteristic of the 19th century. In addition to traditional flat-round, bell and ring weights, the iron founders made oval, pie-shaped, brick, bar, knobbed, octagonal, bun, slotted, cupcake, conical, square-bell and many variations upon these forms. The illustrations show some of the varieties recorded by the author.

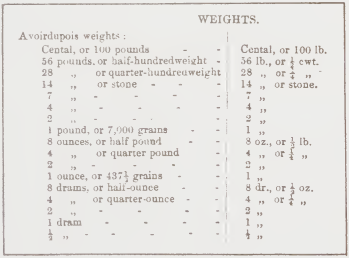
Many of the weights bear the manufacturer's name or initials, others are anonymous. The makers would also supply weights with the name of the wholesaler or retailer who was buying the weights, as can be seen in a catalogue of 1880, which states: "T.& C.Clark & Co. will, on orders for 100 sets and upwards, if required, cast the name of any customer on the 4 lb weight". Thus, the name on a weight may not be the name of the maker. Even a weight maker's name on a weight may not be that of the true maker, as it appears they sometimes commissioned other foundries to make weights. The author has copies of quotations from The Albion Foundry Ltd. and The Crane Foundry Co.Ltd., to T.& C.Clark & Co.Ltd, in 1930, for supplying various weights. For example, the price quoted for flat iron weights of 4 lb was 9s 10d per dozen (12). Clark's price in their catalogue was 14s per dozen - a 'mark-up' of about 40%. Yet, T.& C.Clark & Co.Ltd. were weight makers themselves. Did they have an exceptionally large order unexpectedly ?

SUMMARY OF REGULATIONS FOR IRON WEIGHTS

DENOMINATION

1864 - Every weight to have the denomination stamped on the top or side in legible figures and letters.

1878 - All weights to be of a denomination of a Board of Trade Standard :-



WEIGHTS.

Avoirdupois weights :	
Cental, or 100 pounds	Cental, or 100 lb.
56 pounds, or half-hundredweight	56 lb., or ½ cwt.
28 „ or quarter-hundredweight	28 „ or ¼ „
14 „ or stone	14 „ or stone.
7 „	7 „
4 „	4 „
2 „	2 „
1 pound, or 7,000 grains	1 „
8 ounces, or half pound	8 oz., or ½ lb.
4 „ or quarter pound	4 „ or ¼ „
2 „	2 „
1 ounce, or 437½ grains	1 „
8 drams, or half-ounce	8 dr., or ½ oz.
4 „ or quarter-ounce	4 „ or ¼ „
2 „	2 „
1 dram	1 „
½ „	½ „

DESIGN

1907 - Avoirdupois weights of iron to be either flat-circular, bar, bell or ring-weights, but 50,20,10 and 5 lb to be octagonal.

1907 - All iron metric weights to be hexagonal in shape.

ADJUSTING HOLE

1890 - All weights to have only one adjusting hole.

1907 - All adjusting holes to be in the under-surface of the weight and the holes are not to extend to the top surface.

1907 - In iron weights of flat shape, the hole is to be circular. Adjusting holes of iron weights of other than flat shape to be rectangular or circular. (Sizes of holes were specified.)

METRIC WEIGHTS

1897 - Metric weights legalised for use in trade, in the U.K.

PROTECTIVE FINISH

1907 - No new iron weights to be stamped which are not blacked, black-leaded, oxidised or protected by galvanisation or other process approved by the Board of Trade.

MAKER'S NAME

1907 - The maker's name is not to exceed half the size of the denomination.

RING WEIGHTS

1907 - Iron weights are not to have removable rings or split-rings.

1907 - Iron weights with lead on top, around the ring, are not permitted.*

COPPER PLUGS

1890 - Copper plugs are not permitted. ▷

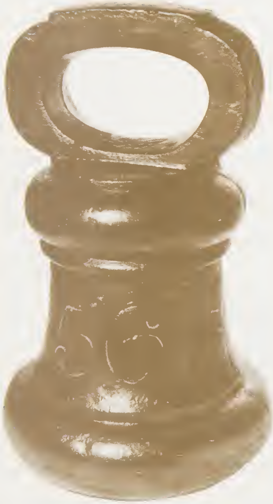


FIG 32.

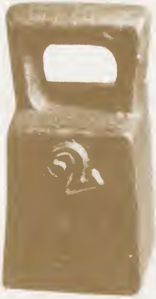


FIG 33.

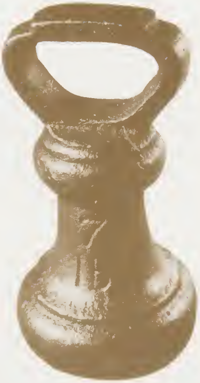


FIG 34.

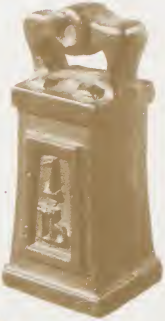


FIG 35.

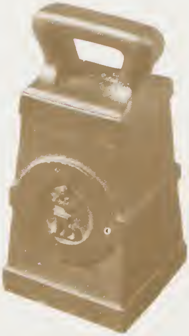


FIG 36.

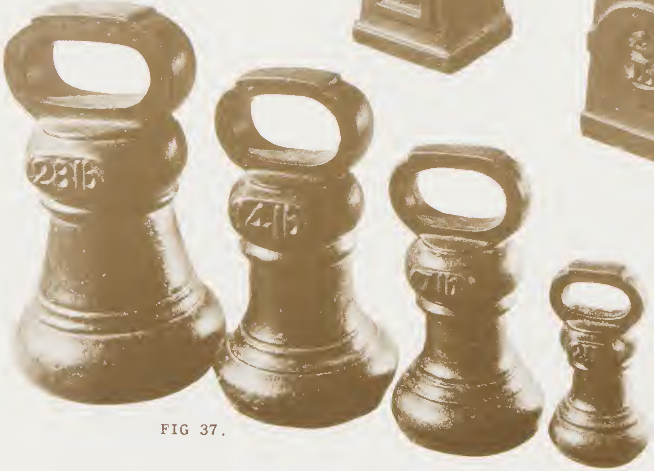


FIG 37.

SIZE LIMITATIONS

1890 - Iron weights of flat shape are only to be made from 4 lb to 4 oz inclusively. Iron weights below 4 oz are not permitted for trade.

1907 - Iron metric weights of less than 100g are not permitted for trade.

IMPERIAL STANDARD

1826 - The term 'Imperial Standard' was introduced in the Act of 1824 which became effective in 1826.

* *Wieghts already in use were permitted to be stamped for 20 years further use, providing they met other normal requirements.*

NOTES ON THE ILLUSTRATIONS

FIG 32. "56", the abbreviation'lb'has been chiselled into the surface crudely, after manufacture. Lead plug underneath stamped Crown 71 / 6.

FIG 33. "2" (2 lb) simplified square-bell weight. Lead plug underneath.

FIG 34. "7 lb" bell weight. Lead plug underneath, stamp obliterated.

FIG 35. "1 lb" square bell weight of the pattern made by W.& T.Avery Ltd. This pattern was superseded by the design shown in Fig 36, shortly after 1900. Lead plug underneath, unstamped.

FIG 36. "4 lb" square bell weight of the pattern made by W.& T.Avery Ltd, early 20th C. Both this design, and the type shown in Fig 35, were used with Roberval scales, see Fig 31.

FIG 37. A part-set of iron bell weights, 28, 14, 7, 2 lb. This sturdy style, with the denomination on a protruding boss, was illustrated in the Crane Foundry catalogue of 1927.

FIG 38. "2" (2 lb) iron steelyard weight. A groove worn in the suspension loop, can be seen in the photograph. Marking the weight on steelyard weights was not common, and often indicates a date of early 19th C or earlier.

FIG 39. Three weights showing the variety of holes used for adjustment. A copper plug was provided on top for the verification stamp. Copper plugs and multiple adjusting holes were prohibited in 1890.

FIG 40. This 1 oz weight is marked underneath,'ENGLAND'. It is not known whether this was a maker's name or an indication of the nationality of the weight units. The excessively large lead plug suggests manufacture before the 1907 Regulations.

FIG 41. Four unusual postal weights made from two parts. The bottom is cast iron, as illustrated by the lower weight which is shown upside-down. The top is a cap of thin sheet brass pressed to form the decoration and the denomination, 4, 2, 1, ½ oz. Date c1930.

FIG 42 "SILK & CO. GREATBRIDGE ¼ lb" The copper plug on top is stamped with a four petalled flower, Common Tormentil (Potentilla erecta). The stamp indicates a date pre 1878, before the uniform system, (See EQM page 47).

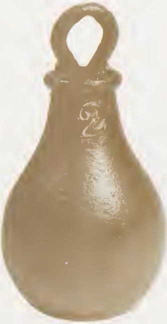


FIG 38.

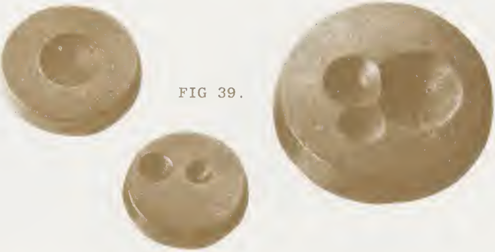


FIG 39.

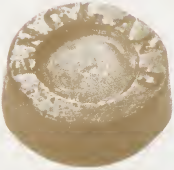


FIG 40.

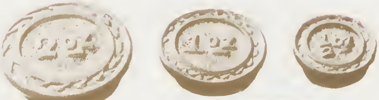
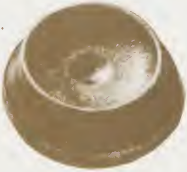


FIG 41.



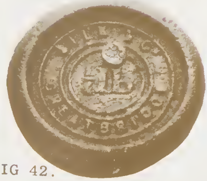


FIG 42.

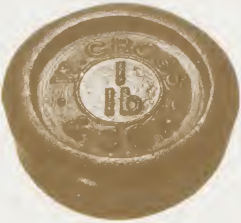


FIG 43.

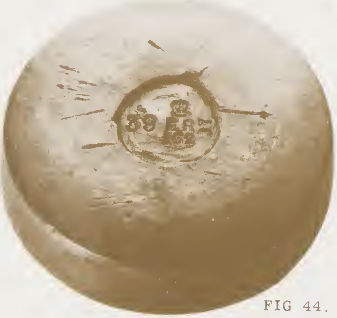


FIG 44.

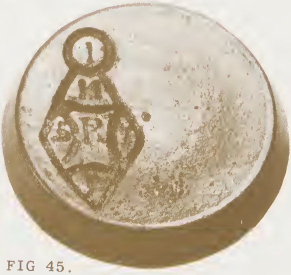


FIG 45.

FIG 46.

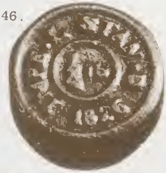


FIG 47.

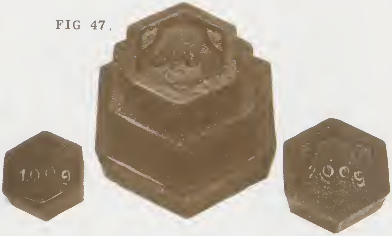


FIG 48.

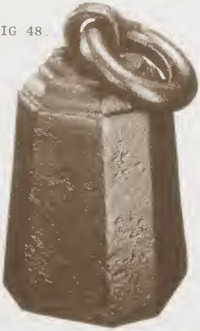


FIG 49.

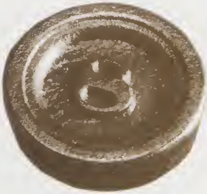


FIG 50.

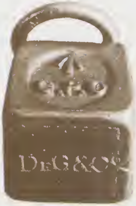


FIG 43. "W.CROSS & SON 1 lb " Lead plug underneath stamped Crown VR 157 1.

FIG 44 "WILLIAM CROSS. ONE POUND 1 lb" The underside of this weight shows a typical English stamped lead plug: A Crown over ER 152 with 37 and 39 at the sides. The monarch's initials are for Edward VII. (Elizabeth I had Crowned E or Crowned EL; Elizabeth II has Crowned EIIR.) No.152 was the W & M district in the North Riding of Yorkshire. The numbers 37 and 39 represent the dates of later stamping, in 1937 and 1939. The top of the weight can be seen in Fig 3.

FIG 45. This Design Registration mark is on the underside of weights by the Crane Foundry Co., see Fig 66 for the top. The mark has the code letter for 1872.

FIG 46. "IMPE.L STAN.D 1826 ¼ lb" Lead plug underneath. 1826 refers to the date of legislation which introduced the term'Imperial Standard'. It was not necessarily the date of manufacture. Reference to this date seems to have continued for many decades.

FIG 47. Modern iron metric weights, 1 kg, 500, 200, 200, 100g. Lead plug underneath stamped Crown 545 7/75. i.e. July 1975.

FIG 48. "7" (7 lb). A ring-weight of unusual and attractive design. Lead plug underneath stamped Crown GR 150. 33. The design and omission of 'lb' suggests 19th century manufacture.

FIG 49. "8" (8 oz). The underside has a central deep hole for a lead plug. Surrounding it are three small and one large adjusting hole.

FIG 50. "G.P.O. ↑ lb 1" on the sides, and "DeG & CO" on the bottom. Lead adjustment around the ring on top. Iron Post Office weights bearing a maker's mark are rare. The initials are those of DeGrave & Co. London.

Part 3 of the Iron Weights article will appear in a future issue of EQM.

Review

DIE MÜNZWAAGE IN DER HAND DES SAMMLERS
(Collecting Money Scales)

This booklet takes an unusual approach to the subject in order to help inexperienced collectors to appreciate the qualities of boxes of scales and weights they own, or propose to buy. All the examples are German, half of them from the old Germanic states of Mark and Berg, which were noted for their fine quality and attractive appearance (See EQM p27). In addition to covering the elementary principles, the author discusses the box and its contents in interesting detail; the construction and finish of the box itself; the paper label; the weights and their form; inscriptions, stamps and colour; and the quality of the scales. Much attention is given to helping the reader to identify original parts, adaptations and possible replacements, and to assess the consequent value.

The author is a bit too critical of replacement parts, demanding that all details should be original. But, users replaced weights which no longer were current, fairly commonly, in the past. However, in the last chapter, he takes a more realistic view (but inconsistent!) that missing parts should be restored as well as possible. The emphasis of the book is too much on how the buyer can be cheated; more practical information on the various details would have been of greater use.

Graphs are used to indicate the price relationship with the number of weights missing, the quality of the scales, and the condition of the label. It is an interesting approach, but I have doubts about its usefulness.

Beginners will find this a helpful booklet, providing they are not led to believe that perfection and monetary value are more important than the pleasure of ownership, or the historical evidence.

G.M.M.H.

'Die Münzwaage in der Hand des Sammlers' by Ralph Bastian. Written in German, printed on glossy paper, 42 illustrations, 60 pages. Available from the author at Am Sundern 7, 5885 Schalksmühle 2, West Germany. Price DM 22 incl. postage by surface mail.

Precision Balance 4

HANS JENEMANN

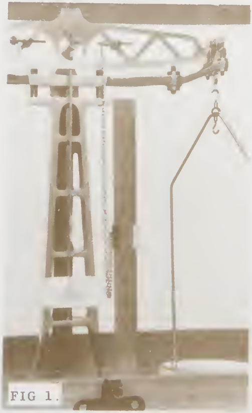


FIG 1.

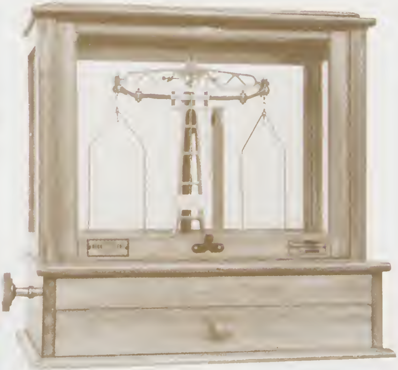


FIG 2.

Courtesy Mettler A.G. Switzerland.

This 'Chainomatic' balance was made by Rhone-Poulenc in Paris, c1925. In the chainomatic arrangement, one end of a chain was fastened to the beam and the other end was fixed to a support which could be moved along a vertical graduated pillar. At the highest position of the support, the reading was zero. By moving the support downwards, that part of the chain suspended from the beam became longer and therefore heavier, Fig 1. In other words, the chain was a clever form of weight. The chain support could be moved from outside the case by a knob on the right side (not visible in the illustration). The knob on the left operates the arrestment mechanism. The balance has a sensitivity of 0.5mg with the maximum load of 200g.

There is also a variation of the chainomatic system where the chain is wound on to a drum, instead of moving along a pillar. In this case, the measurements are indicated on a dial face or rotating drum.

Using the chainomatic arrangement, weighing was faster, compared with a rider weight, because the chain could be altered during oscillation of the beam. Chainomatic balances were favoured by manufacturers in the USA and Western Europe, but not in Central Europe. The first chainomatic system was invented by V.Serrin, of Paris, in 1891. An improved system was devised by Christopher A.Becker in the USA, in 1915. (He was the grandson of Christopher Becker, born in 1805 in Filsum/Hanover, see EQM p477).

Patent Postals

MICHAEL CRAWFORTH

A SURVEY OF POSTAL SCALES PATENTED IN BRITAIN, 1840 TO 1940.

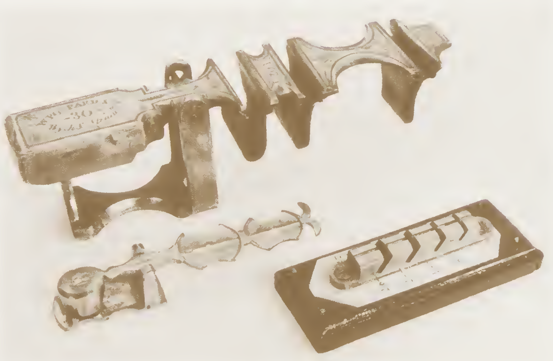


FIG 58. A letter balance by Wm.Poupard, a sovereign balance by Simmons, and a gauge for silver coins by Helliwells. Three items like these were combined in Wedderburn's patent. Compare with Fig 60.

1893 10 Jul. No. 13403. J.WEDDERBURN See Fig 60.

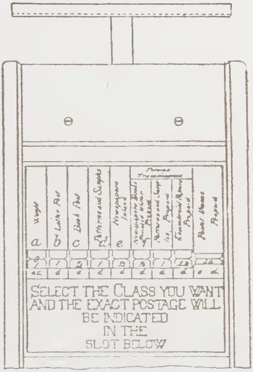
This patent combines existing designs of postal balance, sovereign balance and coin gauge, by placing them together on one base.

No doubt it was convenient to combine three functions in one instrument, but why fix the sovereign balance to the top of the letter balance? No example has been seen by the author, but separate examples of all three items are well known, as shown in Fig 58.

1894 24 Apr. No. 8127. I.S.McGIEHAN See Fig 59.

A pendulum postal balance incorporates a sector of a drum which is marked with the weight and postage rates for letter post, book post, newspapers, etc. This information is displayed through slots in the casing.

The sector of a drum is attached to the scale beam so that, as the beam tilts, the drum rotates past the slots. The abridgement states that the joints and fulcrum are of the knife-edge type. The top-pan design would be convenient in use. No example has been seen by the author.


a
b
c
d
e
f
SELECT THE CLASS YOU WANT AND THE EXACT POSTAGE WILL BE INDICATED IN THE SLOT BELOW

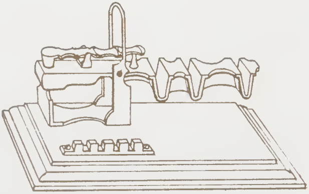


FIG 59. (left) McGiehan's graduated drum.

FIG 60. (above) Wedderburns combination of letter and coin scales & gauge.

FIG 61. (Bottom left) Golaz' multiple graduations, rear view.

FIG 62. Gilfillan's bow-front spring balance, see also Fig 65.

FIG 63 Ubrig's candlestick and quadrant.

1894 1 Jun. No. 10684. J.GOLAZ. See Fig 61.

A half-roberval and pendulum postal balance has multiple graduations for various postage rates, letters, printed papers, and so on. A lever carries a pointer for each row of graduations, each pointer projecting through a slot in the face of the instrument.

This is one of several ideas for presenting different postage rates. Compare it with balances by Blacklock & Hynes EQM p567; Cook p539, and Horn & Albracht p511. No example has been seen by the author.

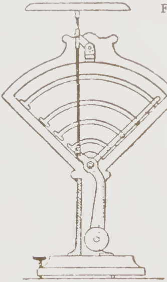


FIG 61.

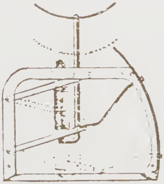


FIG 62.

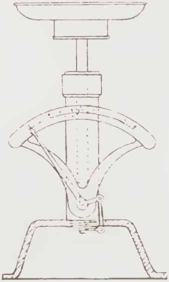


FIG 63.

1896 2 Jun. No. 12010. E.N.GILFILLAN See Fig 62.

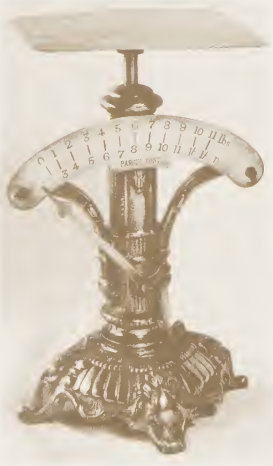
A half-roberval system incorporates a spring as the weighing resistant. The lower stay is extended to form a pointer which passes through a slot in the bow fronted case. The front is graduated with weight and postage rates. A screw attached to the top of the spring permits the pointer to be set at zero.

Many scales of this design have been made, and are still made, in America, Europe and Britain. The illustrations show two versions, one is open-sided, as shown in the patent, the other has an enclosed case attractively decorated, Figs 65 L & R. Other examples can be seen in EQM p 527 & 552.

1897 19 Jan. No. 1478. E.UBRIG See Fig 63.

A top-pan balance with a tension spring resistant, has a linkage connecting the leg to a rotating pointer. The pointer registers on a graduated arc marked with weight and attached to the front of the casing.

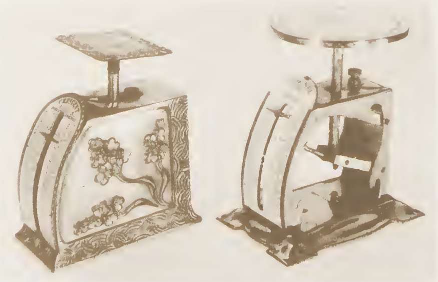
This is an interesting variation of the traditional English 'candlestick' design (See EQM p403 - 408). The use of a linkage and pointer expands the graduations making them easier to read, (but adds friction). Although the patentee does not mention postal purposes, the illustration shows that the design was, in fact, used for that purpose, Fig 64.

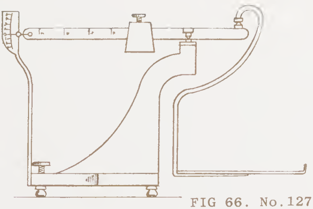


Courtesy Bill Doniger.

FIG 64. (left) Candlestick and quadrant spring parcel balance by Emil Ubrig, for the English market. See patent drawing, Fig 63.

FIG 65. (below) Two bow-front spring letter balances based on Gilfillan's patent. Left, the 'Crescent' by Pelouze, USA, right the 'Criterion' by Setton & Durwood, England.





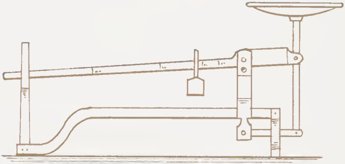


FIG 66. No.12791 and FIG 67. No.11368 both by Krausse.

1899 31 May No. 11368. K.L.KRAUSSE. See Fig 67.

A half-roberval and steelyard postal balance is arranged to be accelerating. The nose of the blade is guided by a forked pillar at the end of the base.

The beam does not move until the weight setting is slightly exceeded, whereupon it tilts to the maximum angle permitted by the guide. This 'accelerating' action provides a rapid indication of whether the load is under, or over the setting - useful for a postal scale where the actual weight of a letter is not important. No example has been seen by the author.

1899 19 Jun. No. 12791. K.L.KRAUSSE. See Fig 66.

A steelyard postal balance has a graduated arc which registers the position of a pointer fixed to the end of the beam. The pointer indicates the amount of weight under or over the setting of the sliding weight.

The use of a graduated arc was not new, although its application to a postal steelyard may have been novel. Although the cone pivots are not mentioned in the abridgement, they are unusual on a postal scale. No example has been seen by the author.

1899 18 Dec. No. 25060. O.BECKMANN See Fig 68.

A spring balance for letters is combined with a pencil or pen, which is concealed inside a split tube letter holder. By sliding a ring along the tapered split tube, the letter is trapped in the slot.

This is another variation of the combined scale and writing implement. The method of operating the pen or pencil is not explained in the abridgement. Presumably, the pen was stored inside the split tube and was removed for weighing. No example has been seen by the author.

FIG 68. Beckmann's combined pen/pencil and spring balance.